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- Volume 1....No. 1, Foreign Relations, parts 1, 2, and 3.
- Volume 2....No. 1, part 2, War, parts 1, 2, and 3.
- Volume 3....No. 1, parts 3 and 4, Navy and Postmaster.
- Volume 4....No. 1, part 5, Interior, parts 1 and 2.
- Volume 5....No. 1, part 6, and No. 2.
- Volume 6....Nos. 3 and 4.
- Volume 7....Nos. 5, 36, 124, and 187.
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- Volume 10....No. 123 to No. 141, inclusive, except Nos. 124 and 133.
- Volume 11....No. 133, Coast Survey.
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THE EXECUTIVE DOCUMENTS

OF THE

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REPORT
OF THE
SECRETARY OF WAR,
BEING PART OF
THE MESSAGE AND DOCUMENTS
COMMUNICATED TO THE
TWO HOUSES OF CONGRESS
AT THE
BEGINNING OF THE FIRST SESSION OF THE FORTY-THIRD CONGRESS.

VOLUME III.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1873.

SECRETARY OF THE

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THE SECRETARY OF THE

THE SECRETARY OF THE

REPORT
OF
THE CHIEF OF ORDNANCE.

THE CITY OF BOSTON

REPORT

OF THE

COMMISSIONERS OF THE

LANDS AND BUILDINGS

FOR THE YEAR 1871

IN RESPONSE TO A RESOLUTION

PASSED BY THE COMMONS

IN MARCH 1870

AND BY THE SENATE

IN APRIL 1870

AND BY THE COMMONS

IN MAY 1870

AND BY THE SENATE

IN JUNE 1870

AND BY THE COMMONS

IN JULY 1870

AND BY THE SENATE

IN AUGUST 1870

AND BY THE COMMONS

IN SEPTEMBER 1870

AND BY THE SENATE

IN OCTOBER 1870

AND BY THE COMMONS

REPORT

OF

THE CHIEF OF ORDNANCE.

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, October 10, 1873.

SIR: I have the honor to submit, for the information of the Secretary of War, the following report of the principal operations of the Ordnance Department during the fiscal year ended June 30, 1873, with such remarks and recommendations as the interests of that branch of the military service seem to require.

The fiscal resources and disbursements of the Department during the year were as follows, viz:

Amount of appropriations in Treasury June 30, 1872...	\$2, 689, 308 62
Amount in Government depositories to credit of disbursing officers on same date.....	336, 958 65
Amount of deposits in Treasury not reported to the credit of the appropriations on same date.....	478, 383 86
Amount of appropriations from July 1, 1872, to June 30, 1873, including the fixed annual appropriation for arming and equipping the militia.....	2, 111, 149 40
Amount transferred from the Quartermaster's Department, from "clothing of the Army," for the manufacture of knapsacks, haversacks, canteens, &c.....	41, 953 33
Amount transferred from Engineer Department, balance of appropriation for railroad-bridge at Rock Island.....	19, 690 43
Amount of appropriation of "sales of stores and materials" assigned to the Ordnance Bureau.....	5, 000 00
Amount of appropriation for "Allowance for reduction of wages under the eight-hour law," on accounts audited and allowed during the year.....	129, 142 43
Amount received since June 30, 1872, on account of damages to arms in hands of troops, from sales of arms to officers, and of condemned stores, and from all other sources not before mentioned.....	476, 166 46
Total	\$6, 287, 753 18
Amount of expenditures since June 30, 1872.....	\$2, 161, 517 16
Amount in Government depositories June 30, 1872, since covered in as miscellaneous receipts, on account of sales of ordnance stores.....	469, 174 51
Amount of deposits in Treasury not reported to the credit of the appropriations June 30, 1873.....	450, 195 44
Amount turned into the "surplus fund" June 30, 1873.	500, 920 37

Amount in Government depositories to credit of disbursing officers June 30, 1873	\$497, 471 27
Amount of appropriations in Treasury June 30, 1873 ..	*2, 208, 474 43
Total	\$6, 287, 753 18

The operations at the several arsenals during the year have consisted of, caring for and preserving ordnance and ordnance stores, manufacturing and altering iron sea-coast carriages, metallic ammunition, and other supplies, preparing for the manufacture of the new-model breech-loading arms for the troops, erection of public buildings under special appropriations, and supplying with arms, &c., the militia of the States and Territories, experiments, &c.

PERSONNEL.

I have again to renew my recommendation, made in the last three annual reports from this office, that the law of March 3, 1869, prohibiting promotions and appointments in the Ordnance Department be repealed. It is hardly necessary to recapitulate the many potent arguments so often presented in favor of this very just measure. The hardship and humiliation to which officers of merit, experience, and long service have been subjected during the past four years by the deprivation of their deserved promotion—the only reward held out in the profession for years of duty well performed—should no longer be permitted, and it is earnestly requested that the attention of Congress be specially called to this matter, that the act approved March 3, 1869, be repealed.

SMALL-ARMS.

The act making appropriations for the support of the Army for the year ending June 30, 1873, and for other purposes, approved June 6, 1872, provides:

“For manufacture of arms at the National Armory, \$150,000: *Provided*, That no part of this appropriation shall be expended until a breech-loading system for muskets and carbines shall have been adopted for the military service, upon the recommendation of the board to be appointed by the Secretary of War, which board shall consist of not less than five officers, as follows: One general officer, one ordnance officer, and three officers of the line; one to be taken from the cavalry, one from the infantry, and one from the artillery: *And provided further*, That the system, when so adopted, shall be the only one to be used by the Ordnance Department in the manufacture of muskets and carbines for the military service; and no royalty shall be paid by the Government of the United States for the use of said patent to any of its officers or employes, or for any patent in which said officers or employes may be directly or indirectly interested.”

In conformity with the above provisions, a board, of which Brig. Gen. A. H. Terry was president, was convened in the city of New York on the 3d day of September, 1872, and concluded its labors and made its report on May 5, 1873. (The report and accompanying papers are here-

* Of this sum \$989,632.66 pertain to appropriations prior to July 1, 1873, and can only be used in liquidating liabilities incurred prior to that time, and \$1,049,984.27 of the balance belongs to the appropriation for arming and equipping the militia, leaving only the sum of \$168,857.50 available for expenditures in the current year

with submitted.) After an exhaustive examination and trial, during a session of eight months' duration, of over one hundred arms, including those adopted by the first military powers of Europe, the board

"Resolved, That the board recommend that the Springfield breech-loading system be adopted for the military service of the United States, in accordance with the provisions of the act of Congress entitled 'An act making appropriations for the support of the Army for the year ending June 30, 1873, and for other purposes,' approved June 6, 1872."

This report, having been referred to this Bureau, was returned to the Secretary of War with the recommendation that it be approved, and it was so approved on May 20, 1873, thus complying, in its spirit and letter, with the requirements of the law.

It was also recommended, and approved by him, that all small-arms—rifles, carbines, and revolvers—should hereafter be of caliber .45 inch. This was in accordance with the opinion of the board of ordnance officers, composed of Majors Benton and Treadwell and Lieutenant Prince, whose exhaustive report of the trials and experiments made at the National Armory and at the Frankford Arsenal, for the determination of the best caliber for accuracy, penetration, and for giving the least load to the soldiers with the greatest efficiency, is appended in connection with the report of General Terry's board, by which the caliber was recommended for the infantry arm.

The Springfield Armory is now engaged in the manufacture of rifles and carbines, on the new model, for the military service; and, in accordance with the recommendation of General Terry's board, as modified by my indorsement and the approval of the Secretary of War, 10,000 of these arms will be supplied with the Rice trowel-bayonet, with the Chillingworth handle, for experimental trial in the field.

In our estimates for the next fiscal year \$500,000 have been asked for continuing the manufacture of arms. This sum will not, with the material on hand, permit us to make more than 35,000 arms, a number the least that should be provided annually to meet current wants and possible future demands. It is not presumable that the new system of breech-loader, selected after such exhaustive tests of all inventions brought before the board, will soon be superseded by any more valuable and efficient system; and it is a grave question of public policy, deserving serious consideration, whether the new arm that has been adopted, after such intelligent and careful trial by a competent board, ought not to be manufactured in such quantities for a reserve supply in case of war as will place us in this part of our national armament on a footing with other first-class powers.

ARMING AND EQUIPPING THE MILITIA.

In this connection, as bearing most vitally on the effectiveness of the armed force of the nation in time of war, the wants of the whole body of the militia is again presented for legislative action. The annual appropriation of \$200,000 for arming and equipping the militia, fixed by the act of April 23, 1808, is entirely inadequate at the present time, with a population increased from eight to more than forty millions. As a consequence, some of the richer States of the Union have had to make appropriations of money to provide the arms, &c., necessary to supply such deficiency, although the intention of Congress, as expressed in the law of 1808, was that the money so appropriated should supply the "whole body of the militia." If \$200,000 were not deemed too much in 1808, when arms, &c., were cheap, as compared with the improved and

costly mechanism now admitted to be a necessity, surely an increase of the appropriation to \$1,000,000 annually is the least that is required to fully meet the wants of the "whole body of the militia" and carry out the express wishes of Congress.

It is believed that all issues of arms and other ordnance stores which were made by the War Department to the States and Territories between the 1st day of January, 1861, and the 9th day of April, 1865, under the act of April 23, 1808, and charged to the States and Territories, having been made for the maintenance and preservation of the Union, are properly chargeable to the United States, and the Secretary of War should be authorized to credit the several States and Territories with the sums charged to them respectively for arms and other ordnance stores which were issued to them between the aforementioned dates, and charged against their quotas under the law for arming and equipping the militia: *Provided*, That each State and Territory before receiving credit for the issues charged to them shall return the property to the Ordnance Department free of charge to the United States, or give satisfactory evidence to the Secretary of War that it was expended or otherwise disposed of in the public service during the rebellion. It is recommended that legislation to this effect be asked of Congress.

HEAVY ORDNANCE.

In my last report attention was specially invited to the absolute necessity of provision being made for the armament of our sea-coast defenses. The importance of the subject increases with the earnest and continued efforts on the part of all nations not only to improve the quality of their guns, but in providing, in quantities, those that have given best results in experimental trials. It is not the part of wisdom to wait for ultimate perfection in gun constructions, which may never be attained, or for the first rumbling of approaching strife, when guns are needed in the fortresses and not in the foundries, to commence the tedious and costly work of construction. In the modern quick and decisive settlement of differences by the arbitrament of arms there is no time for preparation after the declaration of war; and a nation may sink beneath the powerful blows of a well-armed adversary in less time than it takes to manufacture a single gun. It thus becomes the duty of this Bureau to bring to the attention of the War Department and of Congress the paramount importance of a subject upon which the successful defense of the country largely depends. This duty has been performed in years past; and should war with any naval power find our harbors open to the attack of iron-clads and their heavy guns, without proper provision having been made for a successful defense, the responsibility will not rest on this Bureau, which has, with almost disagreeable impotency, placed the matter squarely before the country, and asked for appropriations.

The statement, "Armament of the fortifications," appended, is based on information received from the Chief of Engineers, and shows that the number of guns, of all kinds, required to arm our forts, as far as yet determined, amounts to a total of 4,181. To completely arm all the forts, when the character of their armament is hereafter fully determined, will largely increase this total. Of these 4,181 guns, 2,801, including those on hand, will be needed on the 30th next June. There are on hand, at the forts and arsenals, 1,659 guns, leaving 1,142 required during the next fiscal year.

These guns, carriages, and necessary projectiles should be provided

with all possible dispatch ; but as no rifle of large caliber has yet been adopted for our service, our present wants can be best met by providing the smooth-bores, which are admitted to be the most efficient known. These are positive demands upon this Department for our coast defenses ; not for an undefined future, but for the actual present.

It is, therefore, with all confidence in the justness and necessity of our wants, that an estimate of \$1,449,552 has been made for the armaments of our forts for the next fiscal year, being about one-sixth of the money-value of the absolute requirements ; and this estimate has been so reduced because it is believed that the whole manufacturing industry of the country is not equal to a larger production. The estimate has been made specifically, giving the minimum number of guns that ought to be at once provided for one or more forts that protect each of our most important harbors, that the subject, in its detail and its entirety, may be fairly stated and clearly understood.

Another consideration should not be disregarded. The moneys appropriated by Congress during the past two years for fortifications average \$1,368,000. It would be difficult, if not impossible, to determine the actual cost of each fort per gun, depending, as this must, upon the material of its construction—an earth-work being comparatively cheap as compared with brick or stone or the more costly iron-clad walls—but it is fair to conclude that the guns and carriages, especially guns of steel, like Krupp's, or of wrought iron, like the Woolwich, with wrought-iron carriages, do cost as much as the fort which they arm and defend. The price given by Krupp's agent on July 2, 1872, for a 12-inch steel gun and its carriage, delivered at the works in Essen, was \$48,500 gold. An armament composed entirely of such guns would, it is believed, cost more than the most expensive fort of modern construction.

While, therefore, liberal appropriations are made annually for fortifications, there seems to be strong reason for appropriations of equal magnitude for the armament, when the fact is undeniable that a fort without its proper armament is worse than useless—an inert mass of expensive material, without power of attack or defense.

The heavy rifled guns recommended for trial by the board of officers convened under the provision of the act of Congress approved June 6, 1872, making an appropriation for "experiments and tests of heavy rifled ordnance," are now in process of manufacture. The delays incident to the preparations necessary for constructions of such novel character have had to be overcome ; but it is believed that the four guns now being made will be completed and ready for trial during the winter. No doubts are entertained that much valuable information will result from the trials, which may possibly lead to the early adoption of a suitable rifle-gun of large caliber. Experiments on a large scale, with this end in view, have been prosecuted in other countries for years, and are still being conducted with persistent energy and skill and large expenditure of money ; but a solution of this important question has not yet been reached—not one of such a satisfactory character as to make further expensive trials and experiments no longer necessary before final adoption.

It is respectfully recommended that an appropriation of \$75,000 be asked of Congress for the manufacture and trial of cast-iron 12-inch rifles for experimental purposes. The very great improvement in the character of our gunpowder recently made will justify such an expenditure for the purpose of determining definitely whether cast iron cannot be successfully used in the manufacture of guns of the largest caliber for efficient service. This recommendation is made in the spirit of judicious

economy; for, if cast iron can be made as available for rifles as for smooth-bores, the cost of our guns will be thereby reduced at least one-half or two-thirds, as compared with wrought iron or steel constructions. The reason for this recommendation may be briefly stated as follows: Large-grain powder for heavy guns was first adopted by this Department in 1861, at a time when other nations continued the use of small-grain. This great improvement in the mode of manufacture was the result of careful study and experiment by the late General Rodman, who successfully used it in his first 15-inch gun. This, and his invention of the "perforated-cake" powder, which has been adopted by and is now in use in both Russia and Germany, and the "pebble" powder, similar to our "mammoth," adopted by England, created that revolution in the manufacture of gunpowder, based upon purely scientific principles of combustion and evolution of gases, that has enabled all nations to increase the size of their ordnance.

The necessity for strength in any gun construction depends upon the amount of strain that is brought upon it, and this strain is affected by the method and rate at which the gases are evolved in the burning of the powder-charge, and the rate at which the powder-space behind the shot is enlarged by the gradual movement of the shot through the bore. It is evident that if, by any proper manipulation of the powder in manufacture, the size and form and density of grain can be so determined and adjusted as to confine the strain within certain limits, the strength of the gun to resist such a strain need not reach the maximum requirements of steel, but may be found within the well-known capabilities of our best cast iron.

It must not be overlooked that the resistance of the projectile plays a no less important part in the development of strain in rifled guns, and this resistance becomes destructive when increased, either by the lack of uniformity in the expansion of the sabot in taking the grooves, or by its wedging in the gun from upsetting or breaking of the body of the projectile. It is believed, however, that the shot as now made will overcome these objections by the more perfect adjustment of the parts to the work to be performed, thus giving a uniform resistance to the efforts of the powder.

Recent trials from a 15-inch smooth-bore gun with a new experimental powder, with charges of 100 pounds of powder, and shot of 450 pounds, gave higher velocities with greatly diminished pressures, and a degree of uniformity of action seldom attained by the ordinary granulated mammoth. Each grain or pellet of this powder was formed in dies by pressure. The experiments clearly indicated that it can be manufactured in large quantities, of a uniform quality.

No doubts are entertained that similar results will follow from its use in large rifles, that is, increased initial velocity with marked diminution of pressure. It is in view of these facts that this Bureau is desirous to test cast iron to its fullest extent by experiment, in the hope that it may lead to its practical utilization for the construction of heavy rifled guns.

RIFLING AND VENTING EXPERIMENTAL RIFLE-GUNS.

The determination of the best method of rifling and venting the heavy guns now being made under the act of June 6, 1872, and the character of the powder, projectiles, and carriages to be provided for their trial, was confided to a board of ordnance officers, composed of Lieutenant-Colonel Laidley and Majors Crispin and Baylor, which con-

vened in the city of New York last April. The report of their investigations and recommendations are herewith submitted.

GUN-CARRIAGES.

The very important subject of gun-carriages for fortifications has engaged the attention of this Department. Under General Orders No. 106, of December 13, 1872, a board of officers convened in New York in January last to examine and report upon such plans and models of such depressing and other carriages for heavy ordnance as it might deem worthy of trial. The report of the board, which includes an examination of more than fifty plans, is herewith submitted. Its recommendations have received the approval of the Secretary of War; "carriages provided with air-cylinders (pneumatic buffers)" and the "center-pintle chassis for mortar-carriages" are adopted for the military service. The other recommendations of the board will be carried out whenever funds are available for the purpose.

The object of adapting pneumatic buffers to gun-carriages is for the purpose of absorbing the recoil of the gun when fired. Recent experience seems to prove that in addition to the accomplishment of this object, the buffers perform their work so freely and smoothly as to solve the very difficult problem of platform constructions, which under the old methods of checking the recoil were often shattered by the shock and strain incident to a defective system.

An examination of these several reports will show that every facility was given to inventors, and others interested, to submit their devices, plans, &c., that while the interests of the United States might be best subserved by the widest range of study and examination on the part of the boards, individuals might also have every opportunity for a patient and intelligent hearing on the merits of the inventions presented.

NEW POWDER AND POWDER-DEPOT.

By the last act making appropriations for the support of the Army, authority was given the Secretary of War "to exchange the unserviceable and unsuitable powder on hand for new powder," and under the Secretary's orders steps have been taken by this Bureau to procure a supply under favorable terms.

The rapid deterioration of powder, often under the most favorable circumstances, renders its care and preservation a constant expense to the United States. The want of proper storage has forced this Department to concentrate large quantities of it in our forts, where, through the searching influences of the salt air, its deterioration, begun during the rebellion, has continued with great rapidity.

This experience is the best and strongest argument in favor of a powder-depot, to be located in some retired mountainous region, where it might be free from the worst atmospheric influences and not endanger either public or private interests by its proximity.

One hundred thousand dollars is the least that should be appropriated for the purchase of a site and commence the erection of magazines, and such an appropriation is earnestly recommended.

BREECH-LOADING FIELD-CANNON.

The act making appropriations for the support of the Army for the year ending June 30, 1873, provides "For constructing and testing

Moffat's breech-loading field-pieces, eight thousand dollars." A Moffat gun is now in process of construction by this Department, under the personal supervision of the inventor, and will very soon be ready for trial. It is the intention to try it in comparison, not only with our muzzle-loading field-pieces, but with a breech-loading field-gun, which, with its carriage, ammunition, &c., complete, was recently presented to the War Department by the government of Germany. It is believed that this trial will enable the Bureau to decide on their relative merits by giving us a mass of practical information and results never before obtained in this country.

GATLING GUNS.

The last Army appropriation bill, approved March 3, 1873, provides "For experiments and tests of two Gatling guns of large caliber for flank defense of fortifications, five thousand dollars." Upon the recommendation of this Bureau, a board of one engineer, one ordnance, and one artillery officer was convened last June to take this matter under consideration and make the "experiments and tests" required by the law. Their preparations are now nearly completed, and a report on the results of their labors may be shortly expected. Fifty Gatling guns of caliber .45 inch, for which an appropriation has been made, have been contracted for, and it is expected will be placed in service in the early spring for the use of the troops on the frontier. These guns are of such dimensions and weights as to be easily transported on pack-animals. Their efficiency can only be tested by actual use; but it is thought that they will be far more effective in Indian warfare than the mountain-howitzer heretofore in use.

REVOLVERS.

The general and constant demand from the field for revolvers using the metallic ammunition, together with the urgent necessity for some improved weapon to replace the revolvers previously used in service using the paper or linen cartridge, caused early efforts to be made to reach a solution of this very difficult problem. After trials in the field of two kinds, and experimental trials of improved models, this Bureau recommended for approval the purchase of a sufficient number of the Colt's to supply the cavalry arm of the service. They are now being made, and it is hoped that the whole number will be in the hands of troops before the next spring.

ATLANTIC ARSENAL.

My recommendation, made in previous reports, for the establishment of a large arsenal of construction, a powder-depot, and a proving-ground for heavy guns on the Atlantic coast, is again renewed. This very essential requirement can be best subserved, without a dollar of appropriation, by authorizing the sale of such of the arsenals east of the Mississippi as are no longer of any use to the country, and applying the proceeds of such sales to the purchase of a site and the erection of buildings. The concentration of manufacture in one establishment is the strongest argument in favor of economy and efficiency. The keeping in repair and preservation the many arsenals rendered useless since the war makes an important item in our estimates, and large amounts are thus expended that could be profitably used in manufactures. A gen-

eral law should be passed giving the Secretary of War discretionary power for their sale at such times as would prove most advantageous to the Government, and the proceeds to be applied as suggested. It would be but placing the money value of these establishments, now no longer needed, into a more valuable and profitable investment, with a great annual saving in expenses, and economy in manufacture; and, in this connection, it may be pertinent to say that the act of June 6, 1872, providing for experiments and tests of heavy rifled ordnance, cannot be executed in the spirit of the law with our present facilities of a proving-ground. To efficiently and satisfactorily test a gun it is absolutely necessary to fire it for accuracy. The Department has now a range of less than 1,000 yards; it should have one of six miles, and it is believed that a suitable one can easily be obtained with but a small expenditure of money. It is therefore recommended that Congress be asked to make an appropriation for this purpose in the interests of the national defense.

SALES OF ARSENALS.

The law of June 10, 1872, authorizing and directing the sale of Rome, Champlain, and North Carolina arsenals, and the old arsenal-site at Augusta, Ga., has, in respect to each of those places, been carried into effect, the property realizing satisfactory prices. The Mount Vernon Arsenal, directed by the same act to be sold, has been, by order of the Secretary of War, turned over to the Quartermaster's Department for the use of troops. A modification of the law should therefore be requested, in view of the disposition made of this property.

The title of the United States in the captured lands and tenements at Shreveport, La., Marshall and Jefferson, Tex., and in Marion and Davis Counties, Tex., was found upon investigation not to be of sufficient marketable value to warrant proceedings under the above law, and under the sanction of the Secretary of War the interest of the United States to the Shreveport property has been relinquished to the owners, and the same course offered to be taken with respect to the Marion and Davis County property. On account of failure of title to the other property in Texas, no action has been taken in respect to the same by this Bureau.

The law also authorized and directed the sale of the Apalachicola Arsenal, in Florida. As this property was, by the "act donating Chattahoochie Arsenal to the State of Florida for educational purposes," approved December 15, 1870, directed to be transferred to the board of internal improvements of the State of Florida, the direction for its sale by the act of June 10, 1872, is thought to have been an oversight by Congress. Attention should be invited to the subject, that the matter may be cleared of ambiguity.

I have to recommend that authority be asked of Congress for the sale of Kennebec Arsenal, Augusta, Me., Detroit Arsenal, Dearbornville, Mich., Pikesville Arsenal, Pikesville, Md., and the property at Sag Harbor, N. Y., belonging to this Bureau, but now no longer needed for public purposes.

The several arsenals above named have in past years been of great value and importance, but the present facilities for intercommunication between the most remote portions of the country render their retention an expense, without corresponding benefit.

In this general connection, I have to add that the Charleston Arsenal has, by direction of the Secretary of War, been turned over to the Quarter-

master's Department within the past year for the use of the troops, and that the ordnance depot at Omaha, Nebr., has been broken up and discontinued.

PATENT CLAIMS.

I have the honor again to invite attention to the necessity of some legislation providing for the adjudication and settlement of patent claims that are constantly urged against this Department. I quote from my previous reports:

The chief difficulties which this Department had to contend against in producing a good breech-loading musket have arisen from the impossibility of making any improvement which is not immediately claimed under some one of the many patents which have been granted for improvements in fire-arms, and from the extreme eagerness and strong efforts of some inventors, and all other parties interested in patents, to have their improvements used by the Government. Many persons claim to hold patents for improvements which are used in the conversion of the Springfield muskets; in some instances several parties have claimed to hold patents for the same thing, and it is believed that every improvement is claimed by more than one inventor. The Bureau has declined to acknowledge the validity of any patents for improvements used in the conversion of the Springfield rifled musket, knowing that it was not competent for it to decide the question, and believing that the proper course for patentees to take was to establish satisfactorily the validity of their claims, and then apply to Congress for compensation for the use of the patents.

These difficulties have continued to embarrass this Department, and to affect injuriously the interests of the Government, and it is respectfully suggested whether a law may not be devised which, while affording protection to all inventors in the rights secured to them by patents, will enable the Government to use unrestrictedly any improvement which it may be desirable for it to use. I have no desire to see any inventor deprived of any of his rights, without just compensation; but I am so fully convinced that some law protecting the Government against improper claims of inventors and owners of patents should be passed that I feel it my duty to bring the matter particularly to your notice, in the hope that something may be done to secure so desirable an end. Such a law would relieve this Department of much annoyance and embarrassment, and would tend, in my opinion, to increase to a considerable degree the efficiency of the public service.

It is respectfully suggested that a law be passed which will authorize officers in charge of public works to make use of all inventions or improvements whatever applicable to the work under their charge, and which will provide that when a claim for damages is made by any person for an invention or improvement so used, at least — days' notice shall be given, requiring all parties claiming said invention or improvement to present their claims, with the evidence in support of the same, to some special judicial tribunal authorized to try the same, whose duty it shall be to decide who is the party entitled to damages or remuneration, and to fix the amount which should be paid by the United States for the use of the invention or improvement; their decision to be final, so far as the United States are concerned, and the amount declared to be due from the United States to be paid out of the appropriation for which the work done is paid.

The claim to which I had the honor to refer in my last annual report as having been decided adversely against the commanding officer of Springfield Armory has, upon the recommendation of this Office and the approval of the Secretary of War, been referred to the accounting officers of the Treasury, and allowed. This claim, therefore, is now settled; but other claims against the minor portions of the Springfield breech-mechanism remain as yet unadjudicated and unliquidated, and are a source of embarrassment to this Bureau. Two suits are now pending having reference to alleged infringements in the mechanism of the arm, the one against the commanding officer of the Springfield Armory, and the other against the United States.

A recent opinion of the Attorney-General, upon inquiries propounded by the Secretary of War, touching the general subject of claims arising out of infringement of private patent-rights in the Government shops, estops this Bureau from further consideration of claims arising out of the

past use of such patents. The only extent to which this Bureau is therefore enabled to go, under these circumstances, is to throw its aid in favor of the officers of the Department who may be involved in private civil suits for alleged infringements, and thereby endeavor to break down, if possible, the claims which justly should be brought against the United States. The bringing of these private suits this Bureau is powerless to prevent, and the liquidation of damages, when adjudged, should not be borne by the officers of the Department. I have, therefore, to renew my recommendation above quoted for the appointment of some tribunal who shall be specially empowered to adjust and settle all the remaining claims, conflicting or otherwise, which exist against the arm. The justness of this recommendation is apparent from a consideration of the attitude in which this Bureau is placed with respect to its officers, as well as a consideration of the interests of parties who have equitable claims against the arm.

APPROPRIATIONS FOR PUBLIC BUILDINGS.

The fifth section of the act of July 12, 1870, has proved injurious to the interest of the Government, when applied to the appropriations for the erection of arsenals and other public buildings under the control of this Department.

At some posts—Rock Island Arsenal, for instance—the actual time during which the erection of buildings can be carried on is limited to a few months in any fiscal year; the appropriations not being available until the first of July, several of the best working-months of the year are thus lost.

It would be advantageous to the Government if appropriations for the erection of permanent buildings were allowed to run for three years instead of one year, as now limited, and I recommend that Congress be requested to modify the above-named section accordingly.

I have the honor to submit the following papers in addition to those heretofore mentioned, as appended:

A. Statement of principal articles procured by purchase and fabrication at the arsenals during the year ending June 30, 1873.

B. Statement of ordnance, ordnance stores, &c., issued to the Regular Army and to posts, during the year ending June 30, 1873.

C. Apportionment of arms for the fiscal year ending June 30, 1873, under the law of 1808, for arming and equipping the militia, as amended by the seventh section of the act approved March 3, 1855, and regulations established in conformity therewith.

D. Statement of ordnance, ordnance stores, &c., distributed to the militia from July 1, 1872, to June 30, 1873, under the law of 1808, as amended by the seventh section of the act approved March 3, 1855.

E. Statement of ordnance, ordnance stores, &c., distributed to colleges from July 1, 1872, to June 30, 1873, under the joint resolution of May 4, 1870.

I have the honor to be, very respectfully, your obedient servant,

A. B. DYER,

Chief of Ordnance, U. S. A.

The ADJUTANT-GENERAL,
United States Army.

APPENDIX.

A.

STATEMENT OF PRINCIPAL ARTICLES PROCURED BY PURCHASE AND FAB- RICATION AT THE ARSENALS DURING THE YEAR ENDED JUNE 30, 1873.

3 15-inch Rodman guns.
1 3-inch breech-loading field-gun.
2 15-inch gun-carriages.
26 buckets, sponge.
28 chocks, various.
71 fuse-implements.
294 handspikes, various.
6 sets artillery-harness.
410 harness-bags.
31 front-sights for cannon.
24 priming-wires.
100 rammers and staves.
28 shell-hooks.
100 securing stakes.
19 sponge-covers.
38 sponges and rammers.
165 sponges and staves, various.
3 tangent-scales.
21 tompions, for field and siege guns.
16 tow-hooks.
29 tube-pouches.
9 vent-covers.
41 wipers for mortars.
33 vent-pieces.
7 gun-covers.
1 telescopic rammer.
5 15-inch shot.
20 10-inch shot, experimental.
15 Springfield breech-loading rifle-muskets.
10,001 Remington rifles, locking.
1 Springfield carbine.
1,502 officers' swords.
7 sets cavalry accouterments, altered.
1,309 pistol-belt holsters.
4,003 sets cavalry equipments.
4,746 bayonet-scabbards.
13,097 gun-slings, lengthened.
7,074 infantry equipments.
47,497 appendages, various.
500 cavalry girths.
410 lariats.
240 picket-pins.
82 surcingles, artillery.
6,284 side-lines and hobbles.
500 spur-straps.
10,500 pounds experimental powder.
21,979 cartridge-bags, various, filled.

4,933,007 metallic cartridges for small-arms.
 109 metallic fuses, various.
 3,200 elongated balls.
 317,700 friction-primers.
 572 signal-shells.
 42 blocks and tackle.
 21 loading-cranes for heavy guns.
 4 gin-falls.
 3 gin-slings.
 4 handspikes, gin.
 3 mounting-apparatus, for heavy guns.
 36 rollers, assorted.
 100 shot-beds.
 1 truck.
 18 platforms, assorted.
 43 sets pneumatic buffers, for checking recoil of heavy guns.
 325 various parts of gun-carriages.
 42 collars and parts of artillery harness.
 6 artillery saddles.
 18 rammer-heads, staves, &c.
 600 sabots and tin-straps.
 133,351 various parts small-arms.
 3,425 various parts of swords.
 15,230 parts of infantry and horse equipments.
 13,406 cartridge-bags.
 600 metallic cartridge-cases.
 8,914 arm-chests, packing-boxes, &c.
 758 tools, various.
 12,839 blocks for friction-primers.

B.

STATEMENT OF ORDNANCE, ORDNANCE STORES, ETC., ISSUED TO THE REGULAR ARMY AND TO POSTS DURING THE YEAR ENDED JUNE 30, 1873.

CLASS 1.

10 light 12-pounder bronze guns.
 6 12-pounder mountain-howitzers, (bronze.)
 14 3-inch or 10-pounder rifled guns.
 6 24-pounder siege or garrison guns.
 2 10-inch Rodman guns.
 2 Gatling guns, caliber .50.
 1 Gatling gun, caliber 1.
 5 24-pounder Coehorn mortars.
 2 8-inch siege mortars, (Rodman.)

CLASS 2.

3 Gatling gun-carriages for calibers .50 and 1 inch.
 1 Gatling gun caisson.
 18 12-pounder carriages.
 18 12-pounder caissons.
 18 3-inch 6 and 10 pounder carriages.
 11 3-inch 6 and 10 pounder caissons.

5 12-pounder mountain-howitzer carriages.
 3 12-pounder prairie-carriages.
 4 portable forges.
 3 traveling forges.
 3 battery-wagons.
 6 10-inch barbette-carriages and chassis.
 16 15-inch barbette-carriages and chassis.
 16 100-pounder Parrott barbette-carriages and chassis.
 20 200-pounder Parrott barbette-carriages and chassis.
 8 300-pounder Parrott barbette-carriages and chassis.
 1 top-carriage for 15-inch gun.
 4 24-pounder Coehorn mortar-beds.
 2 8-inch siege mortar-beds, (Rodman.)

CLASS 3.

30 sets of artillery-harness for 2 wheel-horses.
 30 sets of artillery-harness for 2 lead horses.
 5 sets of draught-harness for mountain-howitzers.
 2 sets of draught-harness for ordnance-carts.
 5 pack-saddles and bridles.

CLASS 4.

1 12-pounder shot.
 583 15-inch shot.
 25 12-pounder shells.
 480 24-pounder shells.
 81 32-pounder shells.
 35 8-inch shells.
 35 10-inch shells.
 700 15-inch shells.
 25 12-pounder case-shot.
 150 12-pounder canister.
 250 4.5-inch shot.
 250 3-inch shell.
 125 4.5-inch shell.
 100 30-pounder shot, (Parrott's patent.)
 350 30-pounder shell, (Parrott's patent.)
 150 30-pounder case-shot, (Parrott's patent.)
 50 3-inch Absterdam shot.
 150 4.5-inch Absterdam shell.
 50 3-inch Eureka shell.
 25 3-inch case-shot.
 125 3-inch canister.

CLASS 5.

588 12-pounder shot, strapped and fixed.
 954 12-pounder shell, strapped and fixed.
 680 12-pounder mountain-howitzer shells, strapped and fixed.
 835 12-pounder case-shot, strapped and fixed.
 574 12-pounder mountain-howitzer case-shot, strapped and fixed.
 880 12-pounder canister, strapped and fixed.
 842 12-pounder mountain-howitzer canister, strapped and fixed.
 500 3-inch Parrott shells.

500 3-inch Parrott case-shot.
 320 3-inch Hotchkiss shot.
 240 3-inch Hotchkiss shells.
 310 3-inch Hotchkiss case-shot.
 40 3-inch Hotchkiss canister.
 200 3-inch hand-grenades, (Ketchum's.)
 100 5-inch hand-grenades, (Ketchum's.)

CLASS 6.

3,427 Sharps' carbines, caliber .50.
 35 Sharps' carbines, caliber .52.
 423 Spencer carbines, caliber .50.
 84 Ward-Burton carbines, experimental, caliber .50, 1871.
 2,264 Springfield breech-loading rifle-muskets, caliber .50, 1868.
 4 Remington breech-loading rifle-muskets, experimental, caliber .50, 1870.
 2 Sharps' breech-loading rifle-muskets, experimental, caliber .50, 1870.
 147 Springfield breech-loading rifle-muskets, experimental, caliber .50, 1870.
 2 Ward-Burton breech-loading rifle-muskets, experimental, caliber .50, 1870.
 236 Remington locking-rifles, experimental, caliber .50.
 1,529 Remington single-barrel pistols, caliber .50.
 332 Colt's revolvers, caliber .44.
 1,017 Remington revolvers, caliber .44.
 12 Smith & Wesson revolvers, caliber .44.
 104 sabers, horse-artillery.
 891 light-cavalry sabers.
 26 swords, foot-artillery.
 122 swords, musicians.
 166 swords, non-commissioned officers.

CLASS 7.

117 saber-belts, artillery.
 98 saber-belt plates, artillery.
 3,118 carbine-cartridge boxes.
 955 carbine-cartridge pouches.
 214 carbine-cartridge pouch-slings.
 3,356 carbine-slings.
 4,056 carbine sling-swivels.
 4,220 pistol-belt holsters.
 2,756 pistol-cartridge pouches.
 3,601 saber-belts.
 4,017 saber-belt plates.
 888 saber-attachments.
 1,228 saber-knots.
 1,050 sets of cavalry equipments.
 1,000 sets of cavalry accouterments.
 4,511 bayonet-scabbards.
 122 cap-pouches.
 4,123 cartridge-boxes.
 71 cartridge-pouches.
 2,403 cartridge-box plates.
 2,785 cartridge-box belts.

1,781 cartridge-box belt-plates.
 219 frogs.
 4,336 gun-slugs.
 144 sword-belts for musicians and non-commissioned officers.
 116 sword-belt plates.
 587 waist-belts, non-commissioned officers.
 583 waist-belt plates, non-commissioned officers.
 4,327 waist-belts, privates.
 2,937 waist-belt plates, privates.
 5,432 sets of infantry equipments, complete.
 12,559 canteens.
 7,745 great-coat straps.
 14,345 haversacks.
 8,779 knapsacks.
 3,848 bridles, curb.
 2,854 bridles, watering.
 8,966 curry-combs.
 426 carbine-sockets.
 1,319 girths.
 6,067 halters and straps.
 10,366 horse-brushes.
 880 links.
 5,393 lariats.
 2,427 nose-bags.
 2,765 picket-pins.
 3,281 saddles.
 3,033 saddle-bags.
 265 saddle-blankets, artillery.
 8,666 saddle-blankets, cavalry.
 6,985 spurs.
 7,369 spur-straps.
 3,752 side-lines.
 2,753 surcingles.

CLASS 8.

2,100 6-ounce cartridge-bags, filled.
 2,700 $\frac{1}{2}$ -pound cartridge-bags, filled.
 4,620 1-pound cartridge-bags, filled.
 2,609 2-pound cartridge-bags, filled.
 4,140 6-pounder cartridge-bags, filled.
 8,822 12-pounder cartridge-bags, filled.
 5,493 12-pounder mountain-howitzer cartridge-bags, filled.
 2,750 3-inch and 10-pounder cartridge-bags, filled.
 10,620 Sharps' carbine-cartridges, caliber .50.
 10,000 Sharps' carbine-cartridges, caliber .52.
 26,498 Spencer carbine-cartridges, caliber .50.
 842,766 center-fire carbine-cartridges, metallic, caliber .50.
 2,500 center-fire carbine-cartridges, blank, caliber .50.
 2,068,258 center-fire musket-cartridges, metallic, caliber .50.
 177,244 center-fire musket-cartridges, blank, caliber .50.
 386,700 Martin center-fire musket-cartridges, caliber .50.
 367,988 Colt's and Remington pistol-cartridges, caliber .44.
 480 Colt's and Remington pistol-cartridges, caliber .36.
 14,000 Colt's and Remington pistol-cartridges, blank, caliber .44.
 40,700 Colt's altered pistol-cartridges, metallic, caliber .44.

19,200 Colt's center-fire cartridges, caliber .44.
 7,200 Colt's center-fire cartridges, blank, caliber .44.
 21,130 Smith & Wesson pistol-cartridges, caliber .44.
 8,500 Smith & Wesson pistol-cartridges, blank, caliber .44.
 76,000 Martin pistol-cartridges, Remington, caliber .50.
 91,000 cup-anvil pistol-cartridges, Remington, caliber .50.
 15,000 ball-cartridges for Gatling gun.
 10,000 canister for Gatling gun.
 6,000 pounds cannon-powder.
 16,250 pounds mortar-powder.
 32,500 pounds mammoth powder.
 400 pounds musket and rifle powder.
 91,836 friction-primers.

C.

APPORTIONMENT OF ARMS FOR THE FISCAL YEAR ENDING JUNE 30, 1873
 UNDER THE LAW OF 1808, FOR ARMING AND EQUIPPING THE MILITIA,
 AS AMENDED BY THE SEVENTH SECTION OF THE ACT APPROVED MARCH
 3, 1855, AND REGULATIONS ESTABLISHED IN CONFORMITY THEREWITH.

States and Territories.	Number of Rep- resentatives and Senators.	Money-value.
Alabama	8	\$4,380 29
Arkansas	5	2,737 68
California	5	2,737 68
Connecticut	6	3,285 21
Delaware	3	1,642 61
Florida	3	1,642 61
Georgia	9	4,927 82
Illinois	16	8,760 58
Indiana	13	7,117 97
Iowa	8	4,380 29
Kansas	3	1,642 61
Kentucky	11	6,022 89
Louisiana	7	3,832 75
Maine	7	3,832 75
Maryland	7	3,832 75
Massachusetts	12	6,570 44
Michigan	8	4,380 29
Minnesota	4	2,190 14
Mississippi	7	3,832 75
Missouri	11	6,022 89
Nebraska	3	1,642 61
Nevada	3	1,642 61
New Hampshire	5	2,737 68
New Jersey	7	3,832 75
New York	33	18,068 69
North Carolina	9	4,927 82

Apportionment of arms, &c.—Continued.

States and Territories.	Number of Representatives and Senators.	Money-value.
Ohio	21	\$11,498 26
Oregon	3	1,642 61
Pennsylvania	26	14,235 94
Rhode Island	4	2,190 14
South Carolina	6	3,285 21
Tennessee	10	5,475 36
Texas	6	3,285 21
Vermont	5	2,737 68
Virginia	10	5,475 36
West Virginia	5	2,737 68
Wisconsin	8	4,380 29
Arizona Territory*		1,642 61
Colorado Territory*		1,642 61
Dakota Territory*		1,642 61
Idaho Territory*		1,642 61
New Mexico Territory*		1,642 61
Montana Territory*		1,642 61
Utah Territory*		1,642 61
Washington Territory*		1,642 61
Wyoming Territory*		1,642 61
District of Columbia*		1,642 61
Total	317	189,995 00
Freight, &c		11,005 00
		200,000 00

* Apportionment according to the first paragraph of the President's regulation of April 30, 1855.

D.

STATEMENT OF ORDNANCE, ORDNANCE STORES, ETC., DISTRIBUTED TO THE MILITIA FROM JULY 1, 1872, TO JUNE 30, 1873, UNDER THE LAW OF 1808, AS AMENDED BY THE SEVENTH SECTION OF THE ACT APPROVED MARCH 3, 1855.

3 6-pounder iron guns.
 3 12-pounder bronze guns.
 8 3-inch wrought-iron guns.
 3 6-pounder gun-carriages.
 3 12-pounder gun-carriages.
 8 3-inch gun-carriages.
 2 12-pounder caissons.
 30 sets artillery harness.
 25 gunners' haversacks.

20 sponge-buckets.
 1 paulin, 12 by 15.
 5,484 breech-loading rifle-muskets and appendages.
 150 rifle-muskets, caliber .58.
 150 Spencer repeating rifles.
 150 Maynard carbines.
 244 Sharps' carbines.
 50 Spencer carbines.
 208 Remington revolvers.
 200 cavalry-sabers.
 149 non-commissioned officers' swords.
 3,341 sets infantry accouterments.
 830 cartridge-boxes.
 344 carbine-cartridge boxes.
 50 gun-slugs.
 67 shoulder belts and plates.
 1,264 bayonet-scabbards.
 1,106 waist-belts.
 2,200 cap-pouches.
 2,318 waist-belt plates.
 650 saber belts and plates.
 200 pistol-belt holsters.
 8 saddles.
 8 bridles.

E.

STATEMENT OF ORDNANCE, ORDNANCE STORES, ETC., DISTRIBUTED TO COLLEGES FROM JULY 1, 1872, TO JUNE 30, 1873, UNDER THE JOINT RESOLUTION OF MAY 4, 1870.

4 6-pounder bronze guns.
 4 12-pounder bronze guns.
 2 Coehorn mortars.
 4 6-pounder gun-carriages.
 4 12-pounder gun-carriages.
 8 caissons.
 650 breech-loading rifle-muskets and appendages.
 73 non-commissioned officers' and musicians' swords.
 650 carbine-cartridge boxes.
 650 bayonet-scabbards.
 40 sword belts and plates.
 300 waist-belts.
 300 waist-belt plates.
 389 waist belts and plates.
 27 frogs for swords.
 6 paulins, 12 by 15.

F.

ARMAMENT OF THE FORTIFICATIONS.

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, May 21, 1873.

SIR: I am directed by the Chief of Ordnance to request that this Office may be furnished at an early day with a list of the fortifications now in readiness to receive their armament, or which may become so during the next fiscal year, and a detailed statement of the number and kind of guns, carriages, &c., required to fully arm each work.

To enable this Office to properly present its estimates to the honorable Secretary of War, as well as to form an opinion as to future estimates of funds to arm the fortifications now complete or projected, it is desired to know the cost of the various completed works for each gun mounted or to be mounted for service.

Respectfully, your obedient servant,

S. V. BENÉT,
Major of Ordnance.

The CHIEF OF ENGINEERS, U. S. A.,
Washington, D. C.

OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D. C., August 11, 1873.

SIR: In reply to your communication of May 21, 1873, I send herewith a tabular statement showing, 1st, the total armament required for the various sea-coast defenses now in course of modification or construction under plans approved by the Secretary of War; and, 2d, the portion of this armament which each work will probably be ready to receive and mount on the 30th of June, 1874.

In this table the calibers of the pieces are definitely given only so far as they have been fixed on the plans of the works; where they have not been so fixed they are given as "15-inch or equivalent guns," and it is understood that these will be furnished as smooth-bore and rifled guns in the proportion recommended by the armament board of 1868.

The armament board also recommends that no gun smaller than a 10-inch rifle should hereafter be provided for the barbette armament of permanent fortifications; and, as it is understood that the 10-inch rifle-carriage will be adapted to the present 10-inch gun-platform, it is proposed to dismount all 10-inch smooth-bore and smaller guns en barbette, and supply their places, on such platforms as are not to be removed, with 10-inch rifles; the Rodman guns to be transferred to the casemates.

At the positions designated in the table for depressing carriages the parapets and platforms will be provisionally arranged for the reception of the ordinary carriages.

With respect to your inquiry as to "the cost of the various completed works for each gun mounted or to be mounted for service," I have to say that there are no works which can be as yet considered completed, and that as the money heretofore expended upon them has been to prepare them for the reception of much smaller ordnance than that now proposed, a knowledge of the amount so expended, it would seem, would afford no data upon which to base even an approximate estimate for future appropriations. For a statement of the amount appropriated for the various works up to 1870, I beg leave to refer you to my letter of April 4, 1870, to General J. A. Logan, chairman of Committee on Military Affairs, House of Representatives, Ex. Doc. No. 243, second session Forty-first Congress.

It is, however, thought that the accompanying table itself will be sufficient to enable you to "form an opinion as to future estimates of funds to arm the fortifications," as it not only shows the armament required for the next year, but also shows the total armament required for each work when completed.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Brigadier General and Chief of Engineers.

Brigadier General A. B. DYER,
Chief of Ordnance, U. S. A., Washington, D. C.

Recapitulation of the foregoing tabular statement.

Kind of guns.	Number and kind of guns required for the forts (whose armament has been determined) when completed.	Number and kind of guns required (including those on hand) for works to be ready June 30, 1874.	Number and kind of guns for which estimates have been submitted to Congress for appropriation for their procurement.
20'' smooth-bore guns.....	9	1	.....
15'' smooth-bore guns.....	684	355	75
13'' smooth-bore guns.....	115	45	.....
10'' smooth-bore guns.....	1, 616	1, 070	105
12'' rifled guns.....	52	15	.....
10'' rifled guns.....	760	602	.....
Sea-coast mortars.....	252	79	23
Flank-defense howitzers....	693	634	147
Total.....	4, 181	2, 801	350

NOTE.—It will be seen that the number for which estimates have been submitted for this year is only 350 in all, while the number called for in the next fiscal year, in addition to the number on hand, is 1,142. The number estimated for is believed to equal the capacity of the workshops of the country during the next fiscal year.

G.

HEAVY EXPERIMENTAL RIFLED GUNS.

Report of a board of ordnance officers convened for the purpose of determining the best methods of rifling and venting the heavy rifled guns now making under act approved June 6, 1872, the character of the powder and projectiles and the carriages to be provided for their trial, and also a form of report for the experimental firings.

UNITED STATES ORDNANCE AGENCY,
New York, May 3, 1873.

SIR: I have the honor to transmit herewith the proceedings and resolutions of ordnance board on rifling, venting, &c., the guns now being made under act of June 6, 1872, convened in this city by virtue of your orders of March 29, 1873.

Very respectfully, your obedient servant,

T. G. BAYLOR,
Major of Ordnance.

CHIEF OF ORDNANCE, U. S. Army,
War Department, Washington, D. C.

UNITED STATES ORDNANCE AGENCY,
New York, April 16, 1873.

Proceedings of a board of officers convened in pursuance of the following order, viz :

ORDERS.

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, D. C., March 29, 1873.

A board, to consist of Lieut. Col. T. T. S. Laidley, Ordnance Department, Maj. S. Crispin, Ordnance Department, Maj. T. G. Baylor, Ordnance Department, will convene at the United States Ordnance Agency, New York City, on the 16th day of April, 1873, or as soon thereafter as practicable, to determine and report on the best method of rifling and venting the heavy guns now being made under the act of June 6, 1872, and on the character of the powder and projectiles and the carriages to be provided for their trial.

The Board will also give their views as to the manner and form of making reports of all experimental firings and other experiments ordered, so as to best convey the information desired, with the opinion and recommendations of the officer making the experiments.

Invitations have been given to various inventors in ordnance to lay their views and suggestions before the Board.

By order of the Chief of Ordnance.

S. V. BENÉT,
Major of Ordnance.

The Board met pursuant to the foregoing order, all the members present, at 10.30 a. m., April 16, 1873, and this order read.

The Board then proceeded to discuss the matters before them ; and, pending this, Mr. Arrick, having presented himself in accordance with the invitation of the Chief of Ordnance, conveyed in circular of March 31, 1873, (appended, and marked A,) he was asked to submit his views in writing.

A letter from the Chief of Ordnance was then received, (appended, and marked B,) and with the accompanying papers and drawings filed for reference. (Papers and drawing filed and numbered B 1, 2, 3, 4, 5, 6, and 6^a, 7, 8, and 8^a to 8^g, 9, and 9^a to 9^g, 10, 11, 12, 13, 14, 15, and 16.)

A letter was then addressed to the Chief of Ordnance, asking that reports of experimental firing and information with regard to experimental powders be forwarded. (Letter-book No. 1.)

The Board then continued its discussions until 3 o'clock p. m., when it adjourned to meet at 10 a. m., April 17.

UNITED STATES ORDNANCE AGENCY,
New York, April 17, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present, and continued its discussions.

Mr. Dana, being present, submitted his views on projectiles for rifled cannon in writing. (Filed, indorsed C and D.)

Mr. Norman Wiard came before the Board and had read a letter on the subject of rifling and projectiles for rifled cannon. (Filed, indorsed E.)

The Board, at 3.15 p. m., adjourned to meet at 10 a. m., April 18.

UNITED STATES ORDNANCE AGENCY,
New York, April 18, 1873.

The Board met at 10 a. m., pursuant to adjournment, all the members present.

A communication from Henry C. Swift, of Stockton, Ga., on the subject of projectiles for rifled cannon, was read. (Filed, indorsed F.)

Maj. S. Crispin submitted to the Board a pamphlet entitled, "Comparative trials with steel and chilled shells." (Filed, indorsed G.)

The Board continued its investigations on the subject of rifling and venting; and, at 3.25 p. m., adjourned to meet at 10 a. m., April 19.

UNITED STATES ORDNANCE AGENCY,
New York, April 19, 1873.

The Board met at 10 a. m., pursuant to adjournment, all the members present.

Telegram from Mr. A. C. Stimers proposing to be present on Monday with paper on rifling great guns, read. (Filed, indorsed J.)

Letter from Chief of Ordnance, inclosing papers and drawings asked for by the Board in letter of 16th instant, read. (Filed, indorsed I; papers and drawings marked I¹ to I²¹.)

Letter from Lieut. J. G. Butler inclosing drawings and papers. (Filed, indorsed H; papers, &c., marked H¹ and H².)

The Board resumed its discussions on the subject of rifling and venting guns, and at 3 p. m. adjourned to meet on Monday, April 21, at 10 a. m.

UNITED STATES ORDNANCE AGENCY,
New York, April 21, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

Letter from E. Wiler Dunlap, with diagram, on improvement in projectiles, read. (Filed, indorsed K.)

Letter from Lieut. J. G. Butler, inclosing reports of experimental firing of "hexagonal" and cake powders with different weights of projectiles, forwarded through the Ordnance Office, was read. (Filed, indorsed L; inclosures marked I¹ and I².)

Letter from Lieut. O. E. Michaelis, on the subject of rifling and venting, read. (Filed, indorsed M.)

Mr. Arrick, being present, gave to the Board verbally a description of his projectile, and referred to the records of firing before the Board and on file in the Ordnance Bureau of firings of his 4".2, 8", and 12" projectiles. He proposed to give to the Board a description and sketch of his projectile.

Mr. A. C. Stimers, being present, read a paper on the subject of rifling. (Filed, indorsed N.)

Letter from Lieut. J. G. Butler, inclosing retained copies of experimental firings at Fort Monroe Arsenal of 10" Parrott rifle, 10" Rodman rifle No. 1, 12" Rodman rifle, (Atwater rifling,) and 12" rifles, Nos. 1, 2, and 3, for the temporary use of the Board, read. (Filed, indorsed O.)

Also an extract from official reports of firing. (Filed, marked O¹.)

The Board, at 3 p. m., adjourned to meet at 10 a. m., April 22.

UNITED STATES ORDNANCE AGENCY,
New York, April 22, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

The Board continued its investigations into the subjects of rifling and venting, and also considered the question of the best mode of making official reports of experiments.

Letters were addressed to Messrs. A. Hitchcock and E. A. Sutcliffe, calling their attention to circular from Ordnance Office of March 31, 1873. (Letter-book, 2 and 3.)

The Board, at 3.10 p. m., adjourned to meet at 10 a. m., April 23.

UNITED STATES ORDNANCE AGENCY,
New York, April 23, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present, and continued its investigations into the subjects of rifling and venting.

A letter was addressed to Messrs. Du Pont, at Wilmington, Del., upon the subject of the manufacture of mammoth and hexagonal powders. (Letter-book, 4 and 5.)

Awaiting propositions from several parties on subject of rifling and venting, the Board took up the subject of the carriages to be provided for the experimental guns under consideration.

The Board, at 3.15 p. m., adjourned to meet at 10 a. m., April 24.

UNITED STATES ORDNANCE AGENCY,
New York, April 24, 1873.

The Board met pursuant to adjournment, all the members present.

Dr. W. E. Woodbridge, being present, exhibited a sample with drawing and description of powder, which he recommended for heavy guns generally. (Filed, indorsed respectively P, P¹, and P².)

The Board again took up the subject of carriages for the experimental guns, and finally agreed upon resolution No. 1, in resolutions of the Board.

The Board again took up the subject of projectiles; and, at 2 p. m., adjourned until 10 a. m., April 25.

UNITED STATES ORDNANCE AGENCY,
New York, April 25, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

A letter from Clifford Arrick, giving description and sketch of his projectile, read. (Filed, indorsed Q.)

Dr. W. E. Woodbridge, being present, read a letter on projectiles and rifling, and submitted drawings of same. (Filed, indorsed R; drawings marked R¹ to R⁴.)

A letter from E. A. Sutcliffe with regard to the rifling of his gun was read. (Filed, indorsed S.)

A telegram was sent requesting Mr. A. Hitchcock to come before the Board on to-morrow or Monday. (See Letter-book, 5.)

The Board continued its discussions on the subject of projectiles; and, at 3 p. m., adjourned to meet at 10 a. m., April 26.

UNITED STATES ORDNANCE AGENCY,
New York, April 26, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

Letter from Norman Wiard proposing to rerifle, rebore, and improve Parrott guns in service, referred to the Board by the Chief of Ordnance for its information, read. (Filed, indorsed T.)

Letter from Messrs. Du Pont on the subject of the manufacture of mammoth and "hexagonal" powders, read. (Filed, indorsed U.)

Mr. Thomas Taylor, being present, gave his general views on rifling, venting, and projectiles for heavy rifled guns, and proposed to send them in writing to the Board.

The Board further discussed the subject of projectiles for the experimental guns to be tested; and, at 1 o'clock, adjourned to meet at 10 a. m., April 28.

UNITED STATES ORDNANCE AGENCY,
New York, April 28, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

The Board again considered the subject of projectiles, and also discussed the question of the proper position for the vents of the experimental guns.

Telegram received from Alonzo Hitchcock, stating that he could be present to-morrow, if necessary. (Filed, indorsed V.) Answer sent. (See Letter-book, 6.)

Letter from Lieut. J. G. Butler, on the subject of projectiles and rifling, received; read. (Filed, indorsed W.)

The Board, at 4 p. m., adjourned to meet at 10 a. m., April 29.

UNITED STATES ORDNANCE AGENCY,
New York, April 29, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

Letter from E. Wiler Dunlap, with drawing and description of a proposed "steel vent-plug," (bronze-capped,) received and read. (Filed, indorsed X.)

Letter from Thomas Taylor, of Washington, D. C., on the subject of rifling, venting, and projectiles, received. Upon examination it was found imperfect, and he was communicated with by telegram, with a view to rectify it. (See Letter-book, 7.)

The Board continued its investigation into the subject of venting; and, at 1.30, adjourned to meet at 10 a. m., April 30.

UNITED STATES ORDNANCE AGENCY,
New York, April 30, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

The missing sheet completing Mr. Thomas Taylor's papers to the Board received, and the letters and papers read.—(Filed, indorsed Y.)

The Board then took up the subject of the proper forms for making reports of experiments and tests of cannon, and unanimously agreed to resolution marked No. 6 in resolutions of the Board.

The Board further discussed the subject of venting, and finally agreed upon resolution marked No. 3 in the resolutions of the Board.

The Board again resumed the consideration of the subject of projectiles, and agreed upon resolution marked No. 2 in the resolutions of the Board.

The Board, at 3 p. m., adjourned to meet at 10 a. m., May 1.

UNITED STATES ORDNANCE AGENCY,
New York, May 1, 1873.

The Board met pursuant to adjournment at 10 a. m., all the members present.

Letter from R. P. Parrott, from the West Point foundery, on the subject of rifling and projectiles, received, read. (Filed, indorsed Z.)

The Board again considered the subject of rifling, and agreed on resolution marked No. 4 in resolutions of the Board.

The Board then discussed the subject of the character of powder to be used in the contemplated experiments, and finally agreed upon resolution marked No. 5 in resolutions of the Board.

The Board, at 3 p. m., adjourned to meet at 12 m., May 2.

RESOLUTIONS OF THE BOARD.

No. 1.—CARRIAGES.

The Board is of opinion that the 15" front-pintle carriage, modified only in such details as the dimensions of the guns and peculiarities of the Sutcliffe breech-loading system render necessary, is suitable and best adapted for the 12" (Woodbridge and Hitchcock muzzle-loading rifled) guns and the Sutcliffe 9" breech-loading gun, and accordingly recommends this model for use in the contemplated experiments and tests; and, further, that special (stone and concrete) platforms be provided immediately for each of these guns, and at such places as they may be required.

For the 8" and 9" muzzle-loading converted guns, the Board recommends the present 10" front-pintle barbette-carriage, with pneumatic buffers attached.

No. 2.—PROJECTILES.

For the Woodbridge and Hitchcock muzzle-loading guns.

The Board is of opinion that 1,000 rounds each is sufficient for all experimental tests contemplated to be made with these guns, and also that 750 12" cored projectiles for each gun are required, and recommends the kinds, quantities, and descriptions, as follows, viz: 500 on the plans proposed by Lieutenant J. G. Butler, (marked H and H¹ and H²;) Mr. Clifford Arrick, (marked Q,) and Mr. E. A. Dana, (marked D and D¹ and D²;) each kind to have three different lengths and weights, as follows, viz:

168—26" in length, weight 600 lbs.
166—28" in length, weight 650 lbs.
166—30" in length, weight 700 lbs.

The radii of ogivalic heads not to exceed $1\frac{1}{2}$ and not be less than $1\frac{1}{4}$ calibers.

Thirteen hundred of these projectiles to be of the best gun-metal, selected after sufficient experiments and tests, and 200 of them of suitable cast-steel.

For the 8'' and 9'' converted guns.

The Board is of opinion that 500 rounds for each gun is sufficient for all the contemplated experiments and tests with these guns, and also that 750 9'' projectiles and 750 8'' are required, and recommends the kinds, quantities, and descriptions, as follows, viz:

For 9'' guns.

375—18'' in length, weight 200 lbs.

324—19'' in length, weight 225 lbs.

51—19'' in length, weight 250 lbs.

One-third of each of the above to be made on the respective plans of Lieut. J. G. Butler, Clifford Arrick, and E. A. Dana.—(See descriptions and drawings, marked D and D¹ and D², H and H¹ and H², and Q.)

For 8'' guns.

348—16'' in length, weight 150 lbs.

348—17'' in length, weight 165 lbs.

54—17'' in length, weight 180 lbs.

One-third of each of the above to be made on the respective plans of Lieut. J. G. Butler, Clifford Arrick, and E. A. Dana.—(Description and drawings as before.)

The radii of ogivalic heads for all of these projectiles (8'' and 9'') to be respectively 10'' and $11\frac{1}{4}$ '', and 1,300 of these projectiles to be of the best gun-metal, and 200 of them to be of suitable cast-steel.

For the 9'' Sutcliffe breech-loading gun.

The Board is of opinion that 1,000 rounds for this gun is sufficient for all the contemplated tests, and also that 750 projectiles will be required, and recommends as follows, viz, 450 lead-coated projectiles (cast-iron and steel) of the lengths and weights noted below:

200—18'' in length, weight 230 lbs.

200—20'' in length, weight 250 lbs.

50—22'' in length, weight 300 lbs.

The remaining 300 to be experimental expanding projectiles, of the respective weights of 230 and 250 lbs., in equal quantities, after the plans of Lieut. J. G. Butler, Clifford Arrick, and E. A. Dana, (descriptions and drawings as before,) with a soft-metal ring cast on at the front; no system, however, to be used until proved by preliminary firings equal to, or superior to, the lead-coated projectiles, which latter should be used exclusively in the event of expanding experimental projectiles proving unsatisfactory.

In this connection the Board recommends the quantities designated as required for the number of rounds, deemed sufficient in each case, be not all procured on the first orders for the different kinds, but about one-third of each be first ordered, and subsequent orders be dependent on the results obtained after the firing of a sufficient number in each case shall determine the suitability of the projectiles for a proper test of the experimental guns.

The Board, recognizing the advisability of making some experiments with the converted guns with segmental expanding projectiles, hav-

ing for the end a reduction of pressures comparatively with the systems above selected for the experiments and tests, recommends the following additional projectiles with expanding segmental sabots for experiments and tests with these guns, viz :

30.8" length 17", weight 165 pounds, radii of ogivalic heads 10", and 30.9" length 19", weight 225 pounds, and radii of ogivalic heads 11".25; all to be made of the best gun-metal.

No. 3.—VENTING.

The Board, after full discussion of and investigation into the question of the most suitable position for the vents of the experimental guns under consideration, recommends as follows, viz :

For the 12" Woodbridge and Hitchcock guns.

1. That a hardened copper vent-piece, of the form and dimensions as given in sketch appended, and marked B, be provided, in which the vents are to be drilled.

2. That the axis of vent be perpendicular to plane through axis of bore and trunnions, 3" to left of axis of bore and 4" from the bottom. (See sketch appended, and marked A.)

For the 9" converted guns.

1. That the same kind of vent-piece be provided as for the 12" gun, as above.—(See sketch appended, marked E.)

2. That the position of axis of vent be perpendicular to plane through axis of bore and trunnions, 2".5 to left of axis of bore and 3".5 from bottom.—(See sketch appended, marked C.)

For the 8" converted guns.

1. The same vent-piece as above.—(See sketch appended, marked E.)

2. That the position of axis of vent be the same as is now fixed in the present 10" cast-iron Rodman smooth-bore gun.—(See sketch appended, and marked D.)

For the 9" Sutcliffe gun.

1. That it have a vent-piece with the vent in rear, and axis of bore of gun as shown in sketches appended, and marked F and G, vent piece No. 1.

2. That a second vent-piece be provided, as shown in sketches appended, and marked F and G, vent-piece No. 2.

3. That the axis of vent in this latter case shall be perpendicular to plane through axis of bore and trunnions, 2" to the left of axis of bore and 5".1 from the bottom.—(See sketch appended, and marked F.)

No. 4.—RIFLING.

For Woodbridge and Hitchcock 12" muzzle-loading rifles.

The Board recommends a uniform twist of one turn in 70 feet, 21 grooves and lands; width of lands and grooves equal; grooves .09" deep, and shaped as in appended sketch, marked B.

For 9" converted guns.

The Board recommends a uniform twist of one turn in 60 feet, 17 grooves and lands; width of lands and grooves equal; groove .08" deep, and shaped as in appended sketch, marked E.

For 8" converted guns.

The Board recommends a uniform twist of one turn in 50 feet, 15 grooves and lands; width of grooves and lands equal; grooves .075" deep, and shaped as in appended sketch, marked E.

For 9" Sutcliffe breech-loading gun.

The Board recommends a uniform twist of one turn in 60 feet, 32 grooves and lands; width of grooves and lands equal; grooves .09" deep, and shaped as in appended sketch, marked H. The twist shall be in every case from left to right, except in the Sutcliffe 9" gun, which shall be made from right to left, in accordance with the wishes of Mr. E. A. Sutcliffe.

The Board recommends that the rifling for the 12" guns should terminate at 17" from bottom of bore; that for the 9" converted guns should terminate at 11" from bottom of bore; that for the 8" converted gun should terminate at 10" from the bottom of bore; and that for the 9" Sutcliffe gun should extend to the chamber.

No. 5.—POWDER.

The Board recommends for the contemplated experiments and tests to be made under the act of Congress of June 6, 1872, a "pellet powder" similar in character to the Du Pont "hexagonal powder," recently experimented with at Fort Monroe Arsenal, and that two kinds be made, one adapted for the 12" rifles, and the other for the 8" and 9" calibers.

No. 6.—FORMS OF REPORTS OF EXPERIMENTS AND TESTS.

1. For all experimental firings with cannon, the Board recommends the use of the accompanying form, marked F^a; that a copy of the order under which any experiments are made shall be prefixed to the first report on the subject, and that each subsequent report shall give, under the head of general summary, a condensed recapitulation of all important facts observed or developed in the trials up to date, and on the final report a condensed general summary, covering all important facts and developments observed, with as complete a digest of the results as the experience of the officer, or if a Board, conducting the experiments shall enable him or it, as the case may be, to make; the whole series of reports on the subject to be bound together.

2. That the forms for all experiments and tests not provided for above be made as at present directed by the Department.

T. T. S. LAIDLEY,

Lieutenant Colonel of Ordnance, President.

S. CRISPIN,

Brevet Colonel U. S. A., Major of Ordnance.

T. G. BAYLOR,

Major of Ordnance.

Approved by order of the Chief of Ordnance.

S. V. BENÉT,

Major of Ordnance.

ORDNANCE OFFICE, May 25, 1873.

TARGET RECORD—CLASSES 1, 4, AND 5.

Date of report :

Where trials made :

By whom made :

For what purpose :

Range, yards.

Target feet by feet.

NOTE.—Designate direct hits by ●
Designate ricochet hits by ○

Gun :

Projectile :

No. of hits, direct.

No. of hits, ricochet ||

No. of misses ||

Total number of shots ||

Mean vertical deviation from center of impact

Mean horizontal deviation from center of impact

Mean deviation from center of impact

NOTE.—In obtaining center of impact direct hits only are counted.

 ORDNANCE OFFICE.

Received, 187 .

EXPERIMENTS AND REPORTS WITH CANNON

Target record of firing with

[illegible]

AND PROJECTILES—CLASSES 1, 4, AND 5.

at *from* to , 187 .

SPECIAL REMARKS ABOUT EACH FIRE.

Such as effect on piece, sound of projectile in flight, scattering of fragments, &c., &c.

REMARKS.

REMARKS—Continued.

GENERAL SUMMARY.*

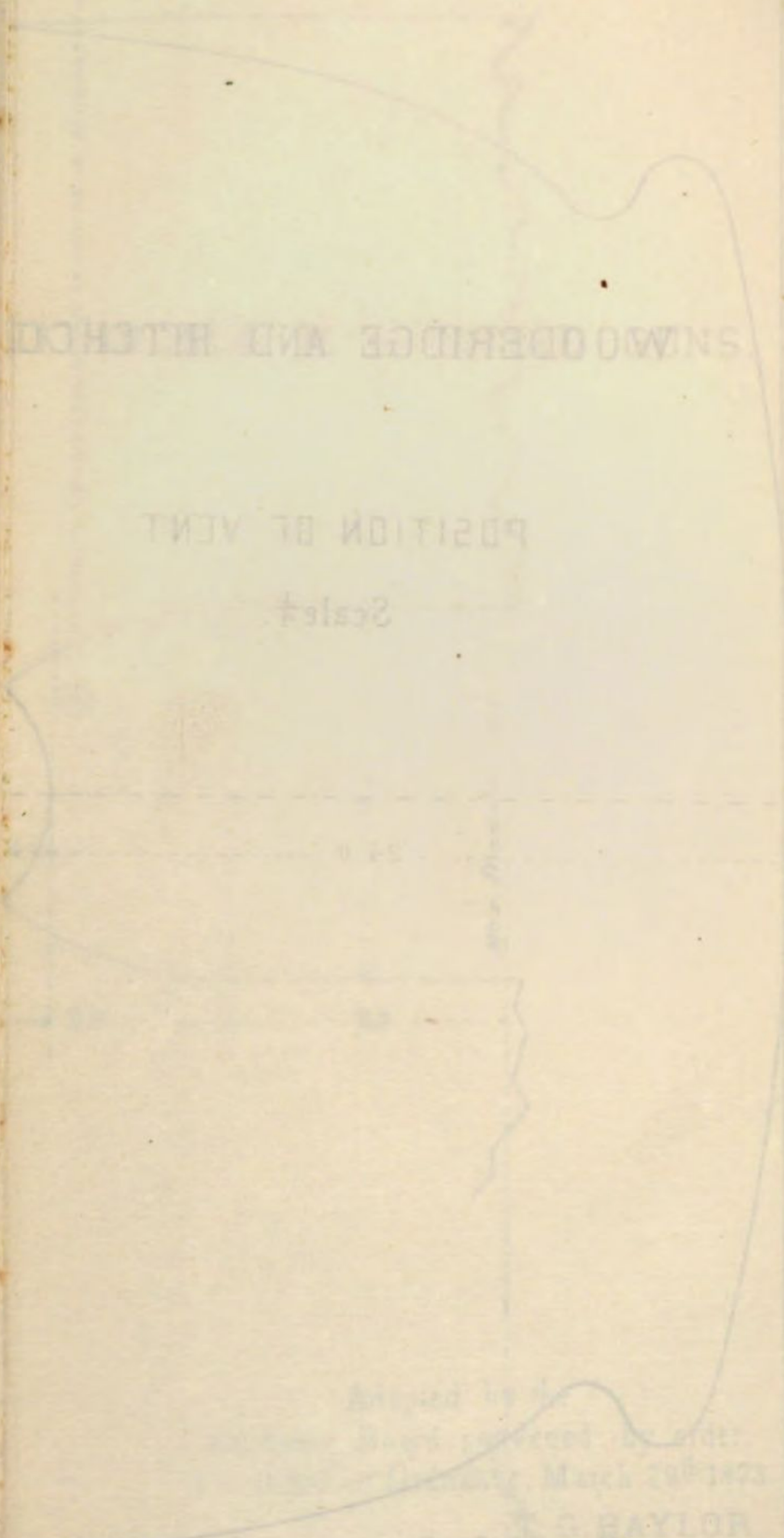
* At the conclusion of a series of experiments on any specific point, a general summary of the whole will be made.

PLATE A.

12 INCH M. L. RIFLED GUNS

Approved by the
Ordnance Board, ordered by the
of the Chief of Ordnance, March 2nd 1876
J. C. BAYLOR
Major, Ordnance
Department

PLATE A



POSITION OF VENT

Scale 1/2

Drawn by

John C. Baylor

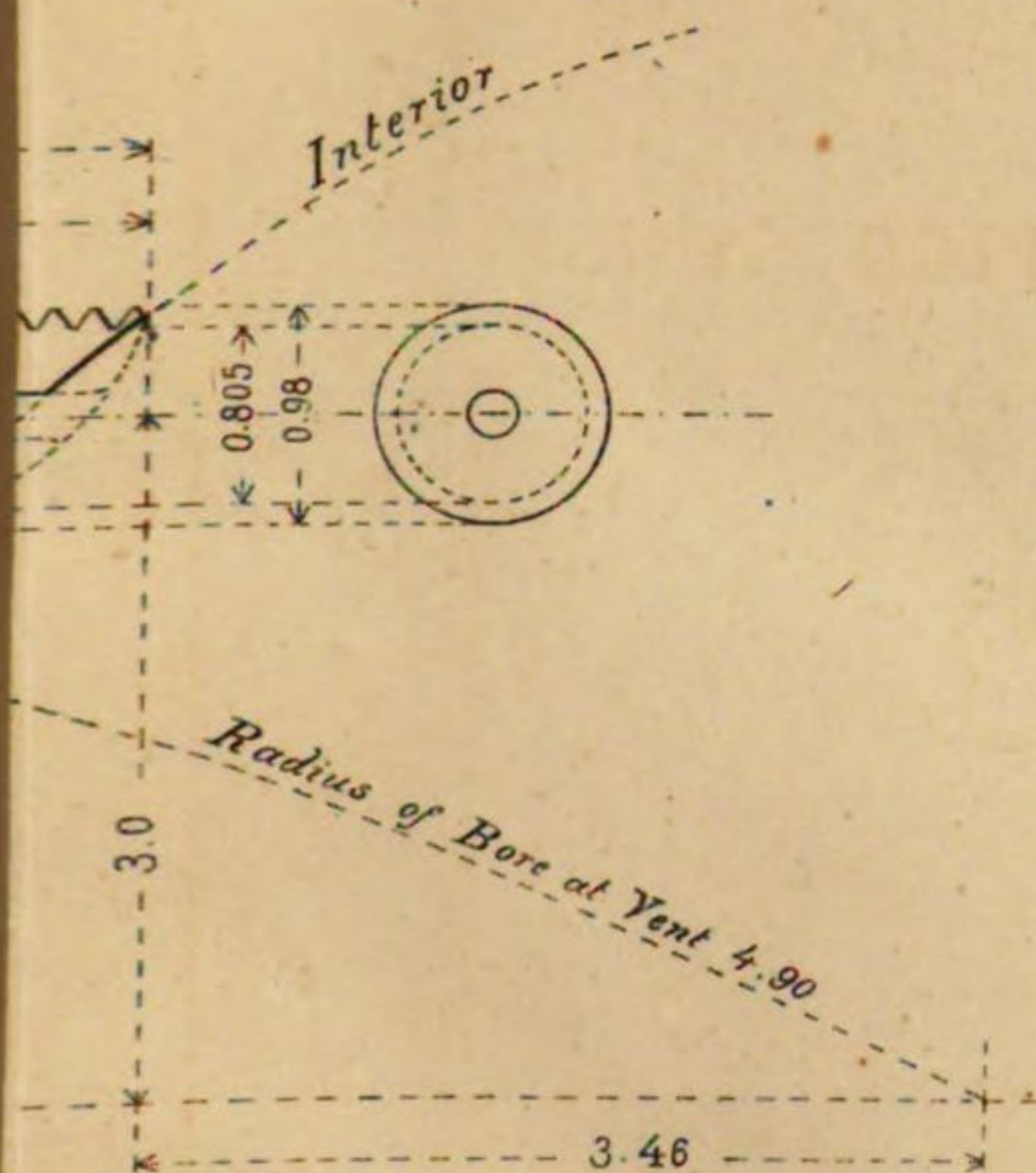
March 29, 1873

J. C. BAYLOR

Geological Survey

Scale 1/2

PLATE B.

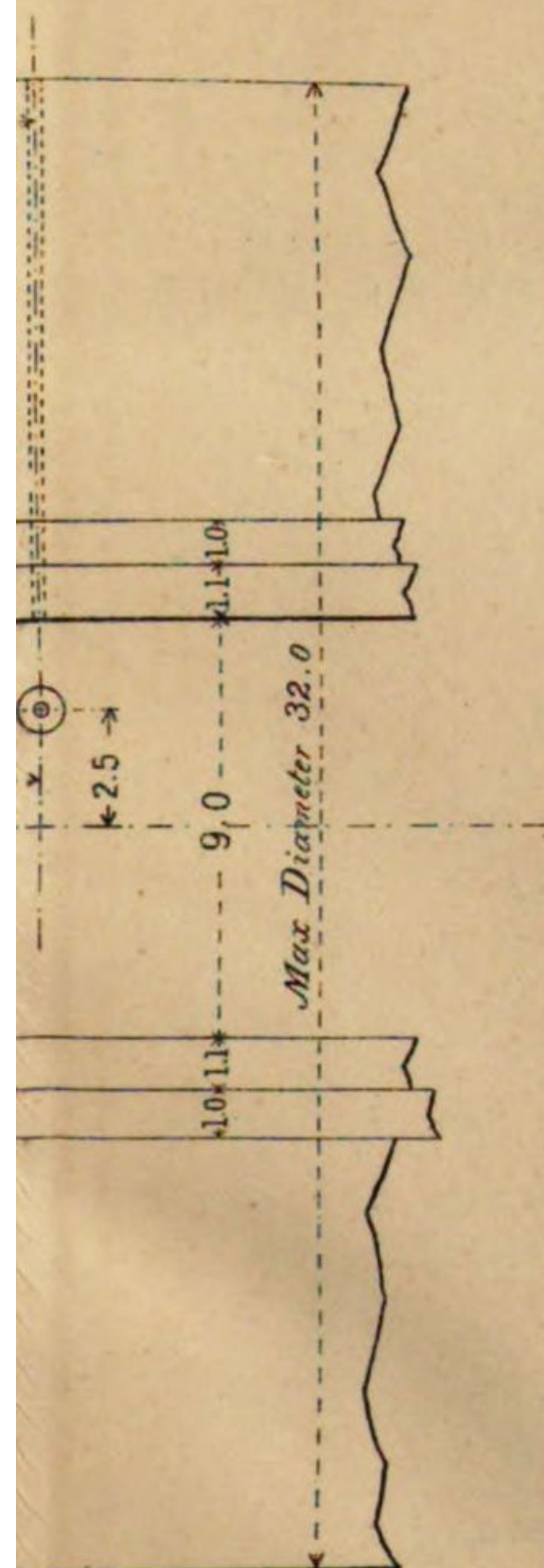


Adopted by the
 Ordnance Board, convened by order
 of the Chief of Ordnance, March 29th 1873.

T. G. BAYLOR,
 Maj of Ordnance.
 Recorder.

PLATE C.

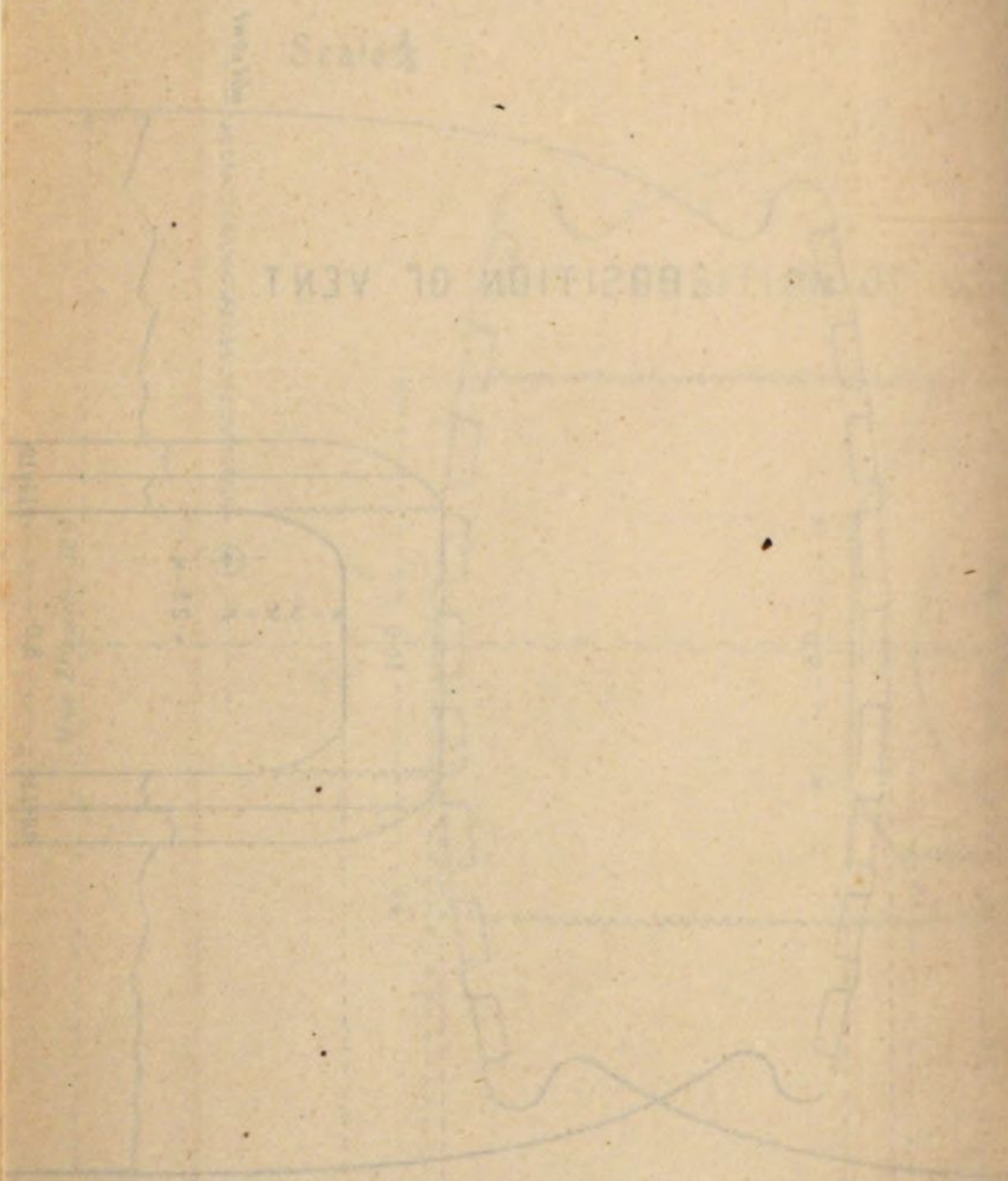
e from the Front.



Opted by the
board, convened by order
Ordnance, March 29th 1873.

T. G. BAYLOR,
Maj of Ordnance.
Recorder.

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SECTION OF VENT
 EAST
 Feet
 Miles

OLDMAN

3.75

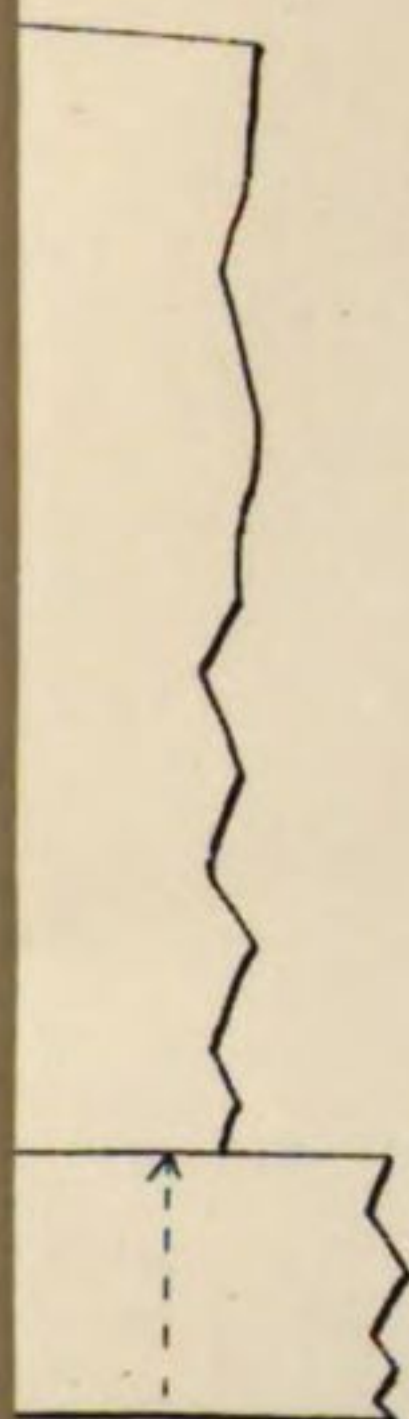
to the inch.

0.075

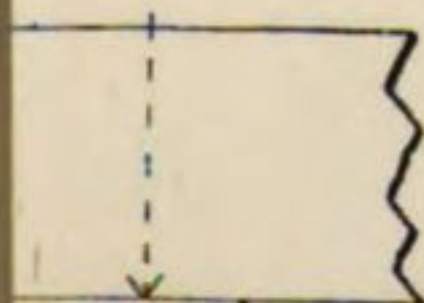
H RIF

nches.

PLATE F.



16.5



ed by the
d, convened by order
dnance, March 29th 1873.

T. G. BAYLOR,
Maj of Ordnance.
Recorder.

DI

of

PLATE 10

RECORDED
MAY 10 1873
T. C. BAYLOR
SPECIAL AGENT IN CHARGE
OF THE
DISTANCE BOARD, COMPTON, BY ORDER
APPROVED BY THE
COMMISSIONER OF THE DISTANCE BOARD

5

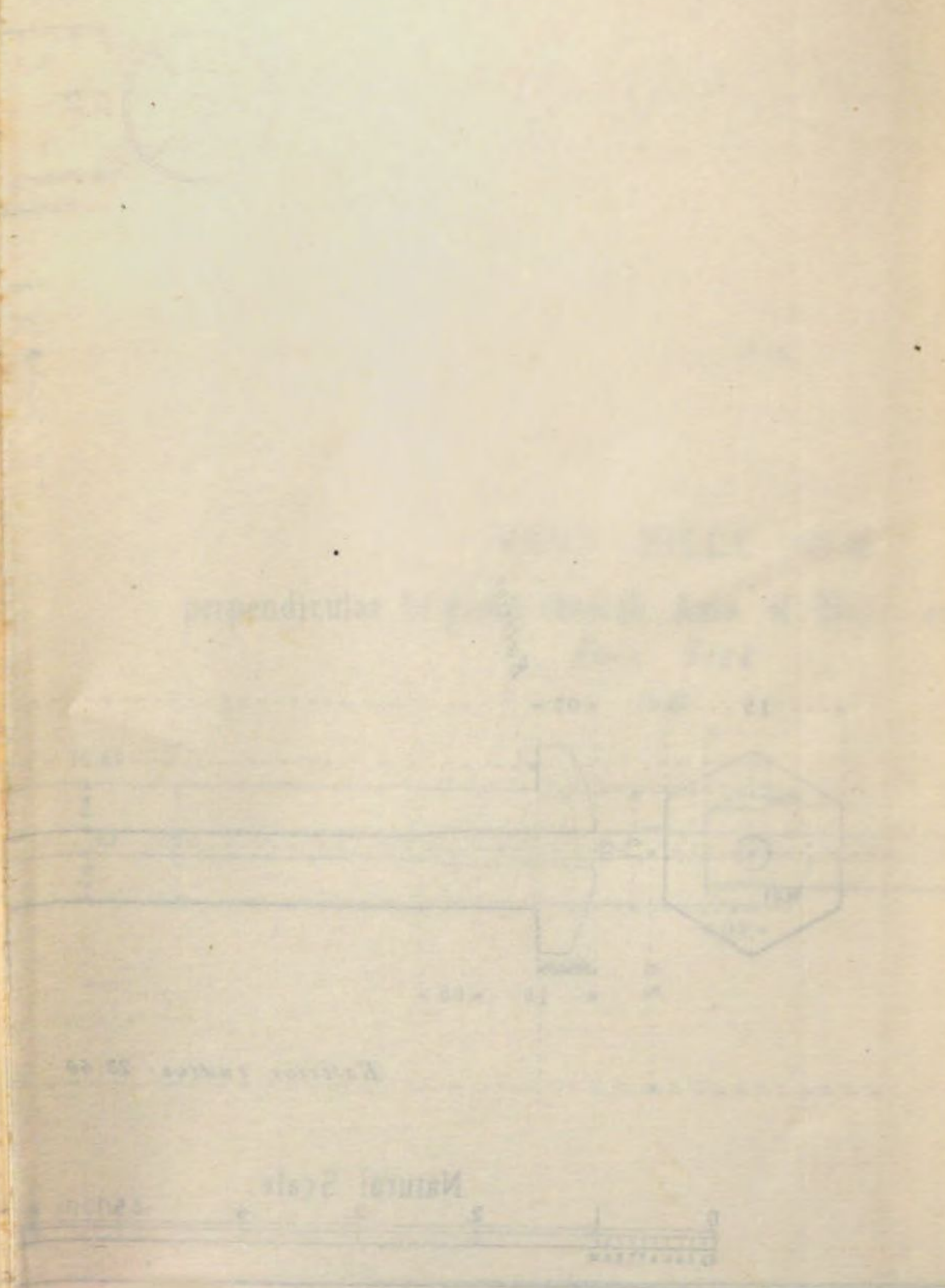


PLATE H.

by the
vened by order
e, March 29th 1873.
T. G. BAYLOR,
Maj of Ordnance.
Recorder.

H.—ORDNANCE MEMORANDA No. 15.

REPORT
OF
THE BOARD OF OFFICERS

APPOINTED IN PURSUANCE OF

THE ACT OF CONGRESS APPROVED JUNE 6, 1872

FOR THE PURPOSE OF

SELECTING A BREECH-SYSTEM FOR THE MUSKETS AND
CARBINES OF THE MILITARY SERVICE, TOGETHER
WITH THEIR REPORT UPON THE SUB-
JECT OF TROWEL-BAYONETS;

WITH AN

APPENDIX, PREPARED BY THE RECORDER, GIVING A DESCRIPTION
OF EACH OF THE INVENTIONS SUBMITTED, WITH A CLAS-
SIFIED NOMENCLATURE OF PARTS AS EXHIBITED
IN THE DETAILED ILLUSTRATIONS
ACCOMPANYING;

TO WHICH IS ADDED

THE REPORT OF A BOARD OF ORDNANCE OFFICERS

ON THE SUBJECT OF

THE PROPER CALIBER FOR SMALL-ARMS.

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REPORT

OF THE

BOARD FOR SELECTING A BREECH-SYSTEM FOR
THE MUSKETS AND CARBINES OF THE
MILITARY SERVICE.

EXTRACT.]

AN ACT making appropriations for the support of the Army for the year ending June thirty, eighteen hundred and seventy-three, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and the same are hereby, appropriated out of any moneys in the Treasury not otherwise appropriated, for the support of the Army for the year ending June thirtieth, eighteen hundred and seventy-three:

* * * * *
For manufacture of arms at the National Armory, one hundred and fifty thousand dollars: *Provided*, That no part of this appropriation shall be expended until a breech-loading system for muskets and carbines shall have been adopted for the military service upon the recommendation of the board to be appointed by the Secretary of War, which board shall consist of not less than five officers, as follows: one general officer, one ordnance officer, and three officers of the line, one to be taken from the cavalry, one from the infantry, and one from the artillery: *And provided further*, That the system, when so adopted, shall be the only one to be used by the Ordnance Department in the manufacture of muskets and carbines for the military service; and no royalty shall be paid by the Government of the United States for the use of said patent to any of its officers or employes, or for any patent in which said officers or employes may be directly or indirectly interested.

* * * * *
Approved June 6, 1872.

OFFICE OF BOARD ON BREECH-LOADING SMALL-ARMS,
New York, May 5, 1873.

SIR: I have the honor to inclose herewith the report of the Board for selecting a breech-loading system for muskets and carbines.

The accompanying documents referred to will be ready for transmission in about ten days or two weeks.

Very respectfully, your obedient servant,

ALFRED H. TERRY,
Brigadier-General and President of the Board.

The Hon. the SECRETARY OF WAR,
(Through the Adjutant-General of the Army,)
Washington, D. C.

(Indorsement.)

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE,
Washington, May 17, 1873.

Respectfully referred to the Chief of Ordnance.

By order of the Secretary of War:

E. D. TOWNSEND,
Adjutant-General.

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DEPARTMENT OF CHEMISTRY
JANUARY 1925
RECEIVED
FROM THE
LIBRARY OF THE
UNIVERSITY OF CHICAGO
JAN 15 1925

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JAN 15 1925

REPORT.

OFFICE OF THE BOARD FOR SELECTING A BREECH-SYSTEM FOR MUSKETS AND CARBINES, *New York, May 5, 1873.*

PREAMBLE.

The Board have the honor to report that, having met on the 3d day of September, 1872, in pursuance of General Orders No. 58, Adjutant-General's Office, Washington, D. C., series 1872, they have continued in session until the present day, with the exception of such adjournments as were required by the necessities or delays of exhibitors, or by the Board for the accomplishment at the Springfield Armory of certain work which was necessary for the complete consideration of the questions involved.

DOCKET.

The following arms and models of arms, and of their parts, were received and entered on the docket as follows :

LIST OF ARMS.

No. 1.	Wooden model.....	Edwin Sleeper.
2.	Musket, cal. .50.....	Gen. B. S. Roberts.
3.	Carbine.....	W. T. Scott.
4.	Magazine-carbine.....	W. R. Evans.
5.	Musket, cal. .50	Sharps Rifle Company.
6.	Wooden model	F. W. Worrell.
7.	Musket, cal. .50	Peabody Rifle Company.
8.	Musket, cal. .433.....	Do.
9.	Carbine, cal. .50	Do.
10.	Musket, cal. .50	E. Whitney.
11.	Musket, cal. .50	Do.
12.	Musket, cal. .50	Do.
13.	Musket, cal. .50	Do.
14.	Musket, cal. .42	J. D. Greene.
15.	Carbine, cal. .42	William Morgenstern.
16.	Musket	Frederick Wohlgemuth.
17.	Musket	Do.
18.	Musket, cal. .50	John Broughton.
19.	Musket, cal. .50	E. Remington & Sons.
20.	Musket, cal. .50	Do.
21.	Musket, cal. .50	Do.
22.	Musket, cal. .50	Do.
23.	Musket, cal. .50	Do.
24.	Musket, cal. .50	W. H. Elliot.
25.	Musket, cal. .50	A. T. Freeman.
26.	Musket, cal. .50	Ward-Burton.

No. 27.	Carbine, cal. .50	Ward-Burton.
28.	Carbine, cal. .50	B. S. Roberts.
30.	Musket, cal. .50	C. M. Spencer.
31.	Musket, cal. .50	E. Remington & Sons.
32.	Musket, cal. .50	W. S. Smoot.
33.	Musket, cal. .50	Oscar Snell.
34.	Musket, cal. .42	S. F. Van Choate.
35.	Musket, cal. .52	W. H. Robertson.
36.	Musket, cal. .50	Capt. J. M. Whittemore.
37.	Musket, cal. .50	John L. Kirk.
38.	Musket, cal. .50	Smith & Chamberlain.
40.	Musket, cal. .50	B. F. Joslyn.
41.	Musket, cal. .43	E. Remington & Sons.
42.	Musket, cal. .50	Updegraff.
43.	Musket, cal. .50, (Ryder extractor)	E. Remington & Sons.
44.	Musket, cal. .50	James F. Thomas.
45.	Musket, cal. .50	John Broughton.
46.	Musket, cal. .42	Westley Richards.
47.	Musket, cal. .50	Schofield-Remington.
48.	Musket, cal. .50	Springfield, mod. 1870.
48½.	Carbine, cal. .50	Springfield.
49.	Wooden model	Alfred Beals.
50.	Musket, cal. .50	I. M. Milbank.
51.	Musket, cal. .50	Do.
52.	Magazine-musket, cal. .44	Stetson.
53.	Musket, cal. .50	James Lee.
54.	Musket, cal. .50	Do.
55.	Wooden model	G. R. Remington.
56.	Revolving carbine	Helm.
57.	Musket, cal. .42	Berdan-Russian.
58.	Magazine-carbine, cal. .45	Ward-Burton.
59.	Musket, cal. .50	A. T. Freeman.
60.	Musket, cal. .58	Mont-Storm.
61.	Musket, cal. .50	James Lee.
62.	Musket, cal. .50	Oscar Snell.
63.	Musket, cal. .50	Peabody.
64.	Musket, cal. .50	B. S. Roberts.
65.	Musket, cal. .50	Earnest.
66.	Musket, cal. .50	Springfield-Stillman.
67.	Musket, cal. .50	Remington-Ryder.
68.	Musket, cal. .50	Springfield-Allin.
69.	Musket, cal. .50	Springfield.
73.	Carbine, cal. .50	Do.
74.	Wooden model	J. B. Rumsey.
75.	Carbine, cal. .50	B. S. Roberts.
76.	Musket, cal. .50	A. T. Freeman.
77.	Carbine, cal. .50	E. Whitney.
78.	Repeating musket, cal. .45	Winchester.
79.	Musket, cal. .42	John Broughton.
80.	Carbine, cal. .50	W. H. Elliot.
81.	Musket, cal. .50	Sharps Rifle Company.
82.	Locking rifle, cal. .50	Remington.
83.	Musket, cal. .50	Merrill.
84.	Musket, cal. .50	William Conroy.
85.	Navy rifle, cal. .50	Remington.
86.	Musket, (Ryder extractor,) cal. .45	Do.

- No. 87. Magazine-musket, cal. .42 William Gardner.
 88. Musket, cal. .45 Springfield.
 97. Magazine-musket, cal. .45 Ward-Burton.
 99. Musket, cal. .45 Springfield.

LIST OF TROWEL-BAYONETS AND PARTS.

- No. 29. Trowel-bayonets Lieut. E. Rice.
 39. Bayonet-handles F. Chillingworth.
 70. Do. Ira Merrill.
 71. Stacking device, (upper band) Do.
 72. Improved side-lock Do.

And also the following attachments, which, though not strictly belonging to any one system of breech-loading fire-arms, were in many cases so intimately related to a special arm, as to call not only for their consideration in that connection, but also to admit other similar inventions of more general application to a no less extended regard.

DETACHABLE MAGAZINES, ETC.

- No. 89. Springfield, cal. .45, with fixed magazine on side of stock. Colonel Benton's plan.
 90. Springfield, cal. .45, with lug on lock-plate for detachable magazine. Colonel Benton's plan.
 91. Springfield, cal. .50, with altered lower band, and stop-pin for temporary detachable magazine. Lieutenant Metcalfe's plan.
 92. Springfield, cal. .45, with fixed magazine. General Hagner's plan.
 93. R. T. Hare's detached-magazine block.
 94. Ira Merrill's fixed magazine.
 95. Springfield butt-stock bored to receive four cartridges; closed by lid swinging upward. James Stillman's plan.
 96. Springfield butt-stock bored to receive four cartridges; closed by lid swinging sideways. James Stillman's plan.
 98. Springfield, cal. .45, with altered lower band and stop-pin for temporary detachable magazine. Lieutenant Metcalfe's plan.
 100. Elliot's cartridge-box.

FOREIGN ARMS.

Various foreign arms examined by the Board :

Chassepot;
 Needle-gun;
 Needle-gun, improved;
 Needle-carbine;
 Mauser;
 Werndl;
 Werder;
 Vetterlin;
 Martini-Henry.

It will be seen that the Board have examined and tried, as far as their facilities in the way of ammunition would permit, all the principal foreign systems of modern date.

TROWEL-BAYONETS.

The question of trowel-bayonets was referred to the Board by an indorsement of the Secretary of War, dated July 27, 1872, and as such formed the subject of a special report, the necessary record and correspondence being excerpted from the general report of the Board.

After the arms at first presented in New York had reached a number large enough to be satisfactorily dealt with, the Board adjourned to Springfield Armory to pursue there the experimental tests which they should determine to apply to such systems among those submitted as might be deemed suitable for the military service.

REGULAR TESTS—CHARACTER.

These tests, involving the susceptibility of the arms to the shock of repeated firing and to the injurious effects of dust, rust, and defective ammunition, were planned also to measure, in some degree, their reserve strength and facility of manipulation, this last quality being most easily gauged by comparing the extreme rapidity of fire of which the different systems were capable.

AMMUNITION.

In order to assimilate as closely as possible to the actual conditions of practice, except for such exhibitions of the utmost power of the arms as might be desired by their representatives, the service .50-cal. musket-cartridge was employed whenever possible, experience having shown that the character of the ammunition might affect very closely the performance of an arm in which it should be tried. The Board was confirmed in this view by the excellent qualities of the ammunition supplied for their experiments, only four or five cartridges in the 20,000 to 25,000 expended in regular firing missing fire, from causes not due to the arm in which they were tried.

PRESENCE OF EXHIBITORS.

For the sake of obtaining the utmost information on the subject of their research, the presence, under proper restrictions, of the representatives of arms was permitted and encouraged.

All the firings into which entered the question of dexterity were conducted by one individual, an employé of the National Armory.

SUPPLEMENTARY TESTS.

At the conclusion of these tests the list of competing arms was read over, and each member of the Board permitted to select from among them such arms as he might desire to have exposed to a second series of tests of the same general character as the first, but differing in the increased severity of their application.

LIST OF ARMS FOR SUPPLEMENTARY TESTS.

The arms so selected were 21 in number, viz :

Peabody, No. 63 ;

Whitney carbine, No. 77 ;

Springfield-Stillman, No. 66 ;

Elliot carbine, No. 80 ;
 Ward-Burton magazine-carbine, No. 58 ;
 Updegraff, No. 42 ;
 Sharps, No. 5 ;
 Springfield, No. 69 ;
 Remington-Ryder, No. 67 ;
 Berdan-Russian, No. 57 ;
 Freeman, No. 76 ;
 Dexter, No. 38 ;
 Lee, No. 61 ;
 Roberts, No. 2, (repaired ;)
 Remington locking rifle, No. 82 ;
 Winchester, No. 78 ;
 Broughton, No. 79 ;
 Sharps, No. 81 ;
 Remington navy rifle, No. 85 ;
 Including the following foreign arms :
 Martini-Henry ;
 Werndl.

REPORT OF CALIBER BOARD.

The report of the Board of Ordnance Officers for the determination of a proper caliber for small-arms, appointed by Special Orders No. 107, Adjutant-General's Office, series of 1872, having by this time been referred to this Board, from among those of the 21 arms above mentioned, which had satisfactorily endured the supplementary tests, the Board selected the following six, viz :

ARMS ALTERED TO CAL. .45.

Springfield, No. 69 ;
 Elliot, No. 80 ;
 Ward-Burton magazine-carbine, No. 58 ;
 Remington navy rifle, No. 85, when supplied with the Ryder power extractor ;
 Freeman, No. 76 ;
 Peabody, No. 63 ;
 which they requested the commanding officer of the National Armory to adapt to the barrel and ammunition recommended by the caliber Board.

FINAL TEST WITH .45-CAL. ARMS—CONCLUSION—SELECTION—RECOMMENDATION OF SPRINGFIELD SYSTEM.

These arms having been received, with the exception of the fourth on the list, for which the Remingtons supplied a substantially similar arm of their own make, No. 86, they were tested for rapidity of firing by the expert, and also by a party of old soldiers and recruits. Without particularizing the special favorable and unfavorable features of each system, fully shown by other portions of the record, the Board has been brought to the conclusion, from their own experiments, as well as from the great mass of confirmatory testimony obtained from the Army in the field, that the Springfield gun, No. 99, of all those presented, is the best suited for our military service. They have, therefore,

Resolved, That the Board recommend that the Springfield breech-

loading system be adopted for the military service of the United States, in accordance with the provisions of the act of Congress entitled "An act making appropriations for the support of the Army for the year ending June thirty, eighteen hundred and seventy-three, and for other purposes," approved June 6, 1872.

RECOMMENDATION OF ELLIOT SYSTEM.

In further accordance with the favorable impressions produced by the trials of these last selected arms, the Board feel it their duty to make the recommendations embodied in the following resolutions, viz:

Whereas the Elliot system has exhibited remarkable facility of manipulation in requiring but one hand to work it, and therefore rendering it especially adapted to the mounted service: Therefore, be it

Resolved, That it be recommended that a limited number of carbines be made after this system for issue to the mounted service, for trial in the field.

VALUE OF MAGAZINE-ARMS.

It was further

Resolved, That, in the opinion of the Board, the adoption of magazine-guns for the military service, by all nations, is only a question of time; that whenever an arm shall be devised which shall be as effective, as a single breech-loader, as the best of the existing single breech-loading arms, and at the same time shall possess a safe and easily manipulated magazine, every consideration of public policy will require its adoption.

MERITS OF WARD-BURTON MAGAZINE ARM AND CARTRIDGE—RECOMMENDATION OF WARD-BURTON MAGAZINE-ARM.

Resolved further, That the experiments before the Board with the magazine-carbine, made upon the Ward-Burton system at the Springfield Armory and using the Metcalfe cartridge, have so impressed the Board with the merits of this gun that they consider it as more nearly fulfilling the conditions above specified than any other magazine-gun tried by them or of which they have any knowledge. Therefore, while unwilling to recommend the immediate adoption of this system in face of the unanimous reports from the Army against the Ward-Burton single loader, it does recommend that a small number of magazine-muskets be made on this plan for further trial in the field.

ADDENDA.

Accompanying the report will be found the following documents:

- I. The daily record of proceedings and adjournments.
- II. The journal of experiments, of which a transcript has been made in the form of a synopsis, giving with each arm the result of its trial under each of the classes of tests.
- III. A condensed tabular statement of the reports from the field, from which are drawn—
 - A. An abstract of preferences.
 - B. A statement of the principal essential parts broken in service, and of the proportionate miss-fires in the different arms.
- IV. An appendix prepared by the recorder, giving a description of each

of the inventions submitted, and intended to accompany a classified nomenclature of the parts shown in the photographic views with which it is understood that the report is to be illustrated.

V. The report of the Board for determining a suitable caliber for breech-loading small-arms, referred to this Board for its consideration and action in connection with the adoption of a breech-loading system for small-arms, by an indorsement of the Secretary of War, dated February 8, 1873.

VI. Various correspondence and documentary exhibits.

ALFRED H. TERRY,
Brigadier-General.

P. V. HAGNER,
Colonel of Ordnance.

H. B. CLITZ,
Colonel Tenth Infantry.

M. A. RENO,
Major Seventh Cavalry.

L. L. LIVINGSTON,
Captain Third Artillery.

HENRY METCALFE,
Second Lieutenant of Ordnance and Recorder.

ADJOURNMENT.

There being no further business before the Board it adjourned *sine die*.

ALFRED H. TERRY,
Brigadier-General and President of the Board.

HENRY METCALFE,
Second Lieutenant of Ordnance and Recorder.

[Indorsement.]

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, May 19, 1873.

Respectfully returned to the Secretary of War, with the recommendation that the recommendation of the Board that the Springfield breech-loading system be adopted for the military service be approved, and that .45-inch caliber be adopted for all small-arms.

The law of June 6, 1872, expressly provides that the system adopted "shall be the only one to be used by the Ordnance Department in the manufacture of muskets and carbines for the military service." Should, therefore, the Springfield system be adopted as recommended, the law prohibits the manufacture of the Ward-Burton magazine and the Elliot gun for trial, as recommended by the Board. Were it not for this prohibition the trial of these guns in the field would be recommended.

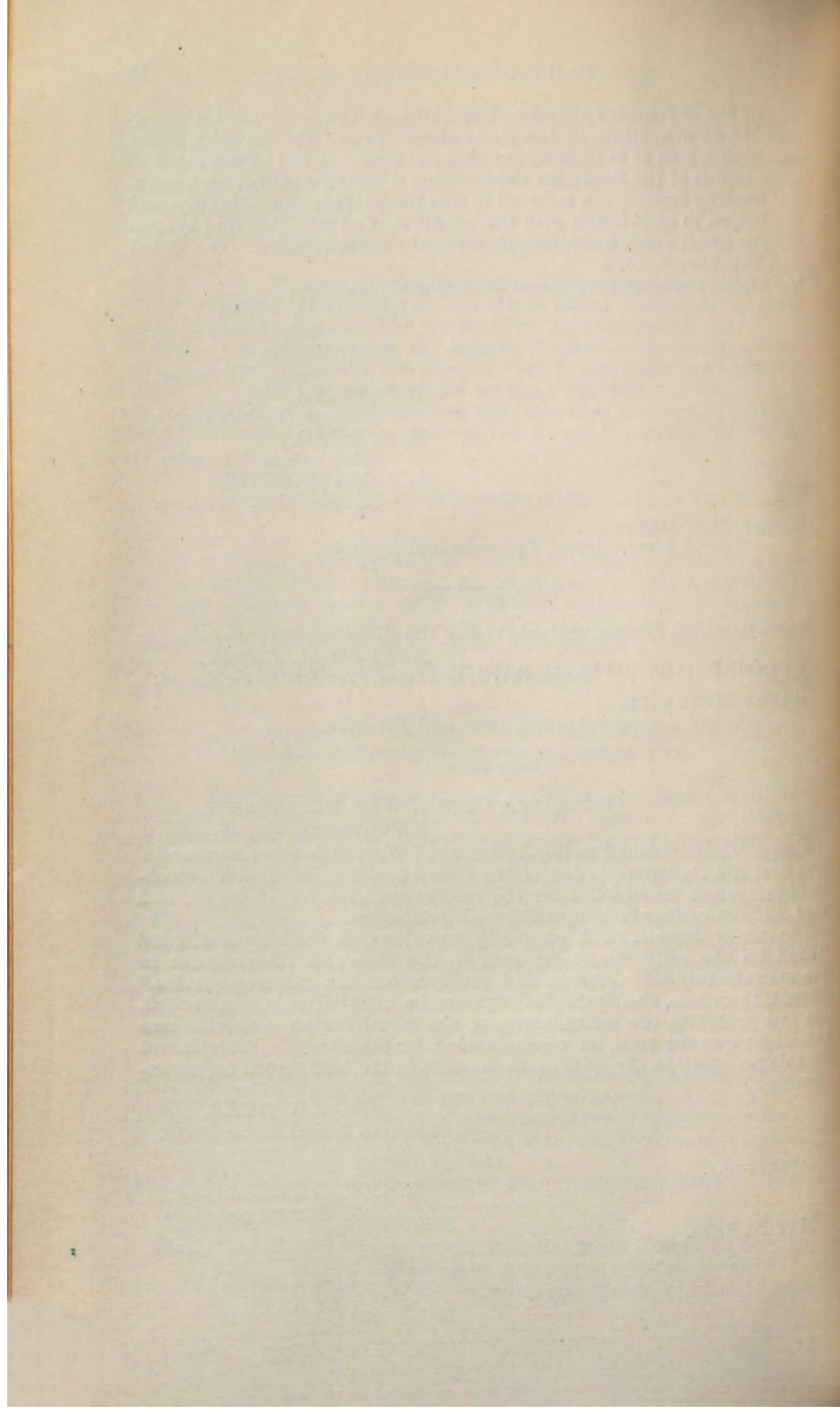
A. B. DYER,
Chief of Ordnance, United States Army.

Approved.

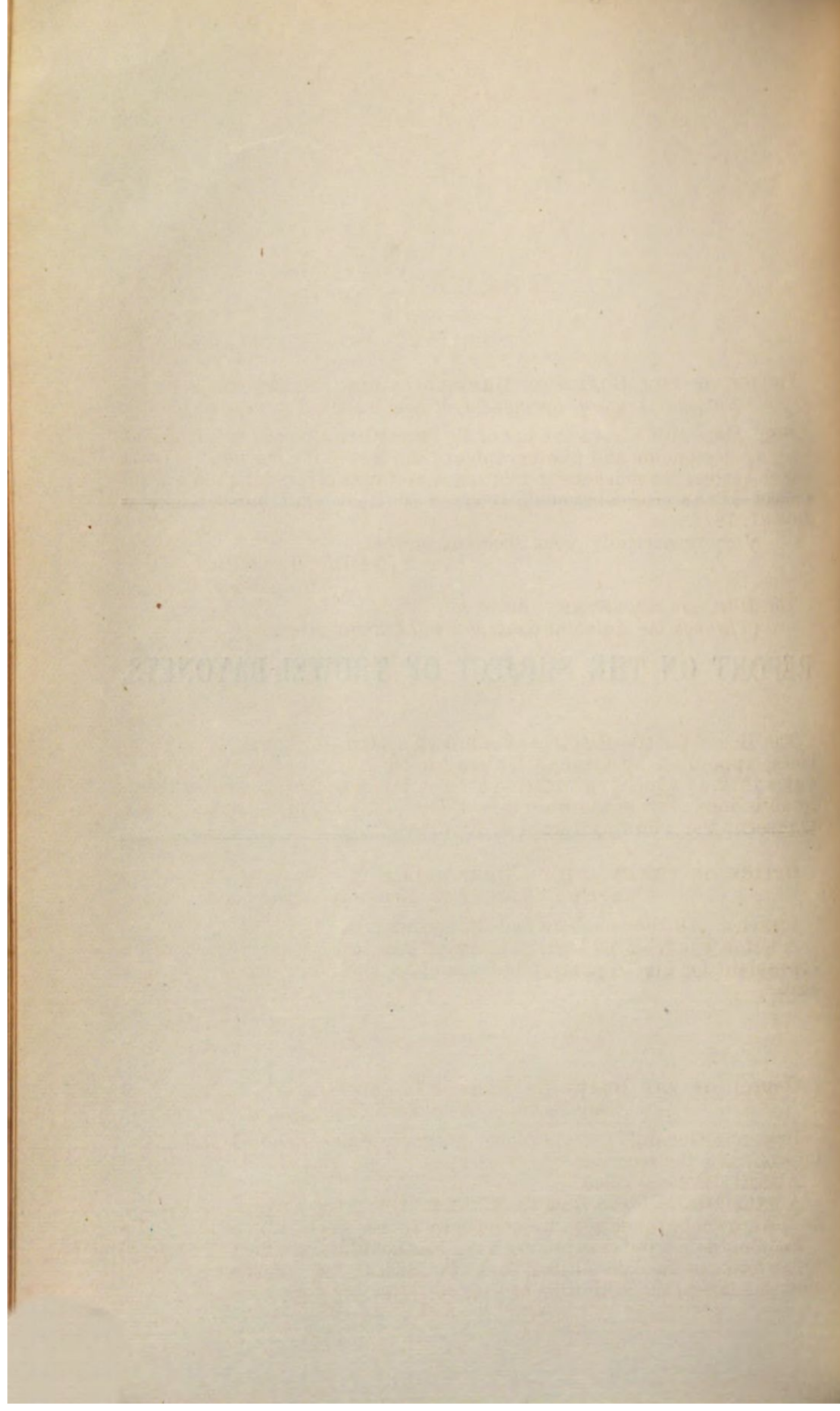
WM. W. BELKNAP,
Secretary of War.

MAY 20, 1873.

4 ORD



REPORT ON THE SUBJECT OF TROWEL-BAYONETS.



REPORT.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
National Armory, Springfield, Massachusetts, February 4, 1873.

SIR: Herewith I have the honor to forward the record, with accompanying documents and photographs, of the Board for the selection of a breech-system for muskets and carbines, so far as it concerns the special subject of the trowel-bayonets referred to it by your indorsement of July 27, 1872.

Very respectfully, your obedient servant,

ALFRED H. TERRY,
Brigadier-General.

The Hon. the SECRETARY OF WAR,
(Through the Adjutant-General United States Army.)

The Board for the selection of a breech-system for muskets and carbines, appointed by General Orders No. 58, Adjutant-General's Office, series 1872, to which was referred the special subject of trowel-bayonets by an indorsement of the Secretary of War, July 27, 1872, has the honor to present the following record of its proceedings:

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 4, 1872.

Present: All the members and the recorder.

A letter was received from Lieutenant Rice, asking when it would be convenient for him to present his trowel-bayonet, to which a reply was sent.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 9, 1872.

Present: General Terry, Colonel Hagner, Major Reno, Captain Livingston, and the recorder.

Absent: Colonel Clitz.

A letter was received from the Chief of Ordnance submitting papers on the trowel-bayonet with indorsements by the Secretary of War.

The Board directed that Lieutenant Rice should be informed, in answer to his letter of the 22d ultimo, that the Board was now ready to consider his invention, authority to that effect having been received.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York September 24, 1872.

Present: All the members and the recorder.

Lieutenant Rice presented samples of trowel-bayonets, which were examined by the Board.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 10, 1872.

Present: Colonel Hagner, Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

The Board experimented with Lieutenant Rice's trowel-bayonet.

Three men, laborers, after some instruction by Lieutenant Rice, in 4 minutes 30 seconds threw up an embankment 20 inches high, 30 inches wide at the base and about 8 inches wide on top, and $5\frac{1}{2}$ feet long, from an area of ground $5\frac{1}{2}$ feet by $6\frac{1}{2}$ feet, and 5 inches deep, which concealed them from observation at a distance of 10 yards when they lay down close to the ground.

With shovels.—The same men, each with a shovel, in 1 minute 45 seconds threw up an embankment of the same length and somewhat greater thickness and height. Working by reliefs of about 1 minute, they threw up a similar embankment in 3 minutes 10 seconds. The soil was a very loose turf overlying a light sand.

As might have been expected from their usual occupation, the men did not complain of the shank of the bayonet blistering their hands.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 11, 1872.

Present: Colonel Hagner, Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

Lieutenant Rice presented specimens of the Merrill handle for bayonets.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 16, 1872.

Present: General Terry, Colonel Hagner, Colonel Clitz, and the recorder.

Absent: Major Reno and Captain Livingston.

Mr. Chillingworth presented samples of trowel and triangular bayonets fitted with his improved handle.

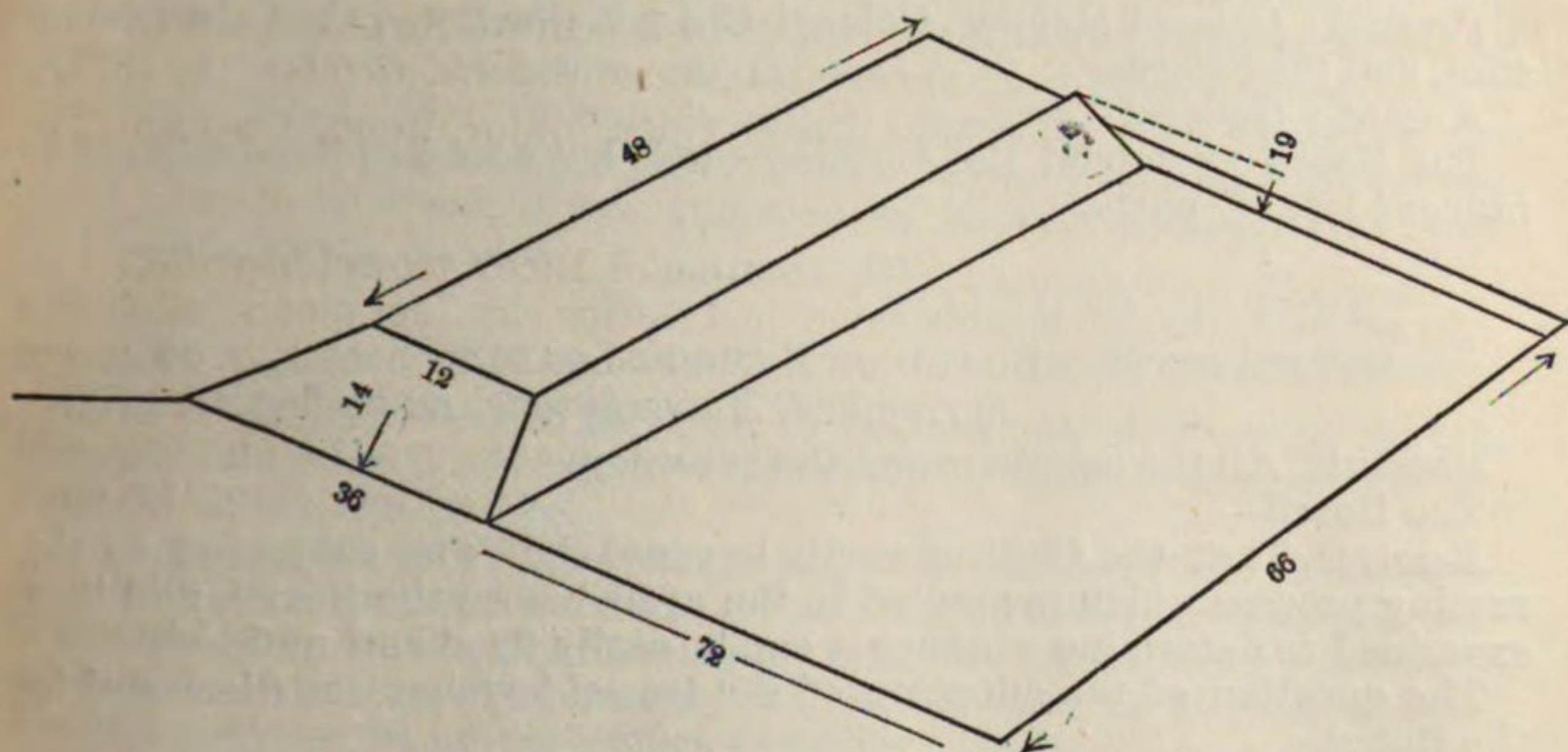
OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 17, 1872.

Present: All the members and the recorder.

Lieutenant Rice submitted letters from officers of the Army concerning his trowel-bayonet, which were read before the Board.

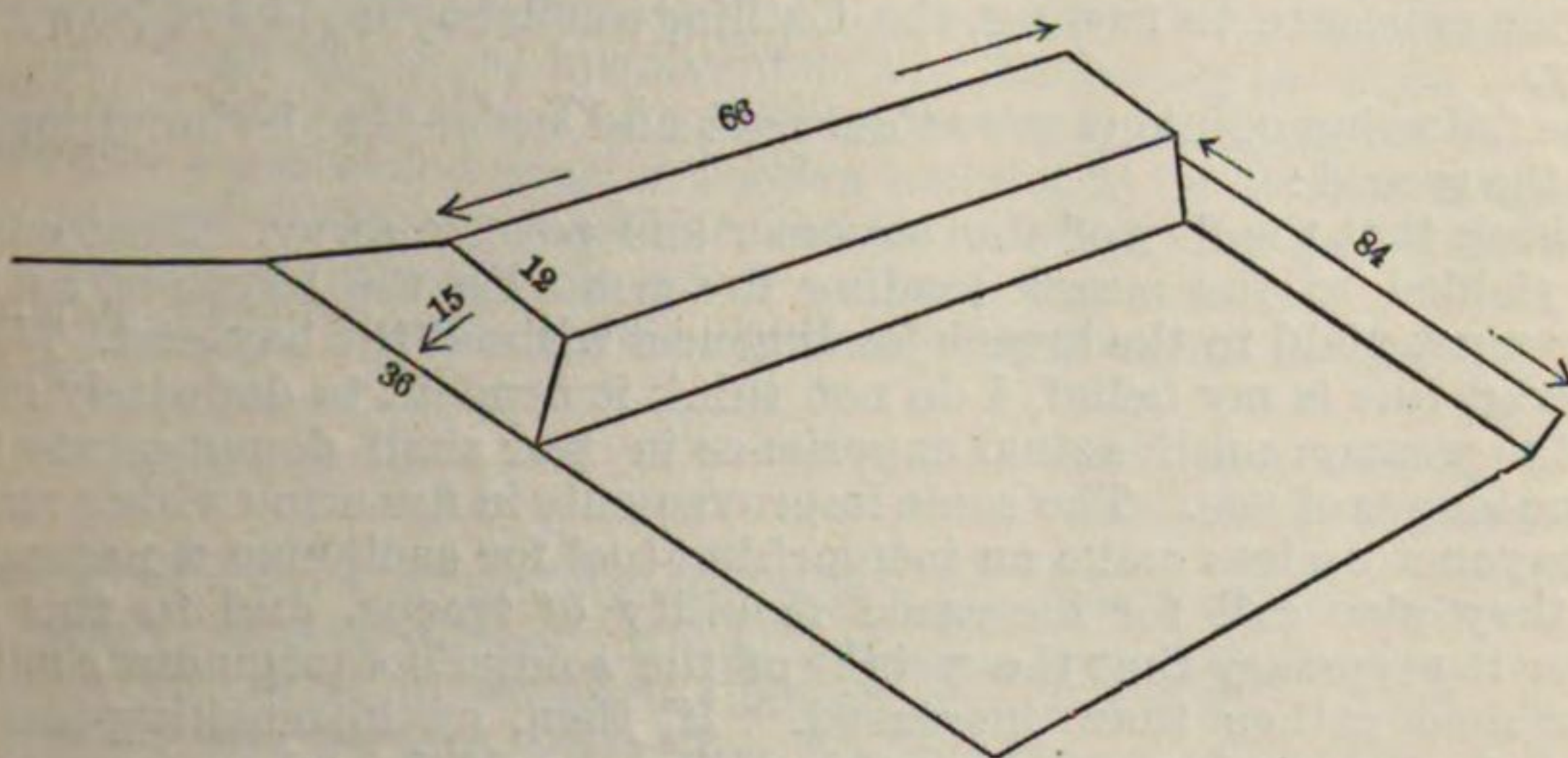
The Board proceeded to further trial of the trowel-bayonet fitted with the Chillingworth handle.

The same three men, equipped with trowel-bayonets, having their sockets filled with wooden plugs, working in a pasture, the ground of which was a well-packed turf, overlying a sandy subsoil thickly seamed with roots, in four minutes threw up an embankment of the following general dimensions.



This did not completely conceal them lying down at a distance of 10 yards.

The same men working in a similar place, but free from roots, in 2 minutes 45 seconds threw up an embankment :



The bayonet fixed on a gun-barrel was then tried as a digging-tool, but was shown to be far less manageable than when detached as in ordinary use.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 21, 1872.

Present: Colonel Hagner, Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

The question of voting on the trowel-bayonet was then discussed, and it was decided to postpone a final decision until after the arrival of General Terry.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 25, 1872.

Present: Colonel Hagner, Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

The Board examined the Chillingworth bayonet-handle, designed to prevent loss of parts.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 20, 1872.

Present: All the members and the recorder.

The Board—

Resolved, That the Chillingworth bayonet-shank be subjected to the rusting process which is applied to the arms before the Board, and then examined to determine whether it can be easily fixed and unfixed.

The question of the adoption of the trowel-bayonet was discussed by the Board.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 22, 1872.

Present: All the members and the recorder.

After exposure to rusting, the Chillingworth bayonet-handle worked freely.

The following opinions were then read and ordered to be incorporated with the record:

I think that the day of the bayonet has passed away. Just as the pike yielded to the muzzle-loading fire-arm with the bayonet, so this latter must yield to the breech-loading arm without the bayonet. While, however, this is my belief, I do not think it prudent to definitely abandon the weapon until actual experience in war shall demonstrate that it is no longer of use. The same improvements in fire-arms which render the bayonet useless make an intrenching-tool for each man a necessity; but they also call for increased mobility of troops, and to this end render it necessary that the weight of the soldier's equipment shall be diminished rather than increased. If, then, an intrenching-tool be added to the equipment, something else should be taken from it. I think there is no part of it which can be so well spared as the bayonet, and notwithstanding my opinion that prudence requires that the bayonet should be retained until experience shall demonstrate that it is valueless, if it were necessary to dispense with it in order that an intrenching-tool might be carried, I should advocate its abandonment.

The trowel-bayonet, however, if it be efficient in both capacities, spares us the necessity of making a choice between the two. I frankly confess that when it was first presented to the Board I thought it, as an intrenching-tool, a mere toy; but the experiments with it which we have seen have convinced me that in this respect it is exceedingly efficient. I am satisfied that troops provided with it can completely

shelter themselves from musketry fire in a very few minutes; so shelter themselves that, with good breech-loading arms, their position will be nearly impregnable. As a bayonet, while it is not suited to practice in the fencing-schools, it will, I think, be as efficient as any weapon of the kind in the rough thrusting of actual conflict.

I cannot attach much importance to the principal objection urged against its adoption, that its use will detract from the military appearance of troops, (we are in search of the useful, not the beautiful;) and it can and always should be worn sheathed, never fixed except it be needed as a bayonet in action, should such a contingency occur.

In order, then, that without sensibly increasing the weight of the soldier's equipment he may carry both a bayonet and an intrenching-tool, I vote to recommend the adoption of Rice's trowel-bayonet with the Chillingworth handle.

ALFRED H. TERRY,
Brigadier-General.

Colonel Hagner desires to state, in explanation of his vote, that he does not consider it advisable or necessary to attach a tool of this description to the rifle-musket.

As the most important and costly article of the soldier's equipment, the gun requires constant care to keep it in good order, and particularly to protect it from the slightest injury affecting its accuracy; hence, to use it for any purpose *by authority*, increasing the risk to such injuries, does not seem to be proper unless *decidedly necessary*.

The use for which the trowel is intended must soon injure its appearance, and make it unsuitable to be attached to a well-kept rifle-gun; hence, if the soldier is authorized to subject this part to rough usage he will be apt to be less careful of other parts of the arm.

As no advantage is claimed in the use, either of trowel or gun, from the incongruous combination, it seems that the above consideration should outweigh the slight inconvenience of increasing by a few ounces the soldier's load. Hence, Colonel Hagner would recommend the use of a suitable *earth-trowel*, with a wooden handle, to be carried attached to the valise of the infantry soldier, and to retain for the gun a bayonet of the present universally approved pattern, but reduced in length of blade to about 12 inches, as the present length is no longer deemed necessary.

P. V. HAGNER,
Colonel of Ordnance.

The trial of Rice's trowel-bayonet before the Board has convinced me of the great value of a light intrenching-tool in the hands of each soldier, but I am not at all satisfied that we should not spoil the bayonet and adopt an inferior intrenching-tool by trying to combine the two. I should much prefer to recommend that the present triangular bayonet be retained, and a light steel intrenching-tool, with wooden handle and of an approved pattern, be issued to each enlisted man of infantry, artillery, and engineers, as part of his equipment. I therefore vote against the adoption of Rice's trowel-bayonet.

H. B. CLITZ,
Colonel Tenth Infantry.

The experiments made with the trowel-bayonet before the Board, under the supervision of Lieutenant Rice, the inventor, show conclusively its great value as a means of providing men with cover promptly, an indispensable condition when the accuracy and range of the armaments

of the present day are considered. It is surely as effective as an offensive weapon as the old one.

No other objections than an unsightly appearance, the possible chance of the soldier bending his gun-barrel, and the inability to stack arms, can be urged against it. The first is too trivial to consider; the second is proved by experiment to be unfounded, as the bayonet works better in the hand than on the gun, (see Record,) and the third is easily obviated by a simple device of Mr. Merrill, to attach a small iron hook to the upper band of each gun, to be hooked into the swivels of the two remaining guns necessary to complete the stack; but in any event, in my opinion, its value as a means of providing shelter in a short space of time outweighs the objections.

I am not in favor of adding weight to what the soldier already carries, as is proposed by attaching a trowel to the knapsack, as the necessity for increased mobility of troops, if possible, is well recognized. A majority of officers, under whose supervision this bayonet has been tested, agree in giving it a decided preference. I vote for the adoption of the bayonet.

M. A. RENO,
Major Seventh Cavalry, member.

I strongly recommend the adoption of Rice's trowel-bayonet for the use of the Army, to substitute the bayonet now in use.

L. L. LIVINGSTON,
Captain Third Artillery.

The following resolution was then passed:

Resolved, That the Board recommend to the War Department that Rice's trowel-bayonet, with the Chillingworth attachment, be adopted for the use of the military service.

ALFRED H. TERRY,
Brigadier-General.

P. V. HAGNER,
Colonel of Ordnance.

H. B. CLITZ,
Colonel Tenth Infantry.

M. A. RENO,
Major Seventh Cavalry.

L. L. LIVINGSTON,
Captain Third Artillery.

HENRY METCALFE,
Second Lieutenant Ordnance, Recorder.

[First indorsement.]

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE,
Washington, February 7, 1873.

Respectfully submitted to the Secretary of War.

E. D. TOWNSEND,
Adjutant-General.

[Second indorsement.]

ORDNANCE OFFICE, *March 6, 1873.*

Respectfully returned to the Secretary of War, with the recommendation that 10,000 of these trowel-bayonets be made and issued to the

troops for trial. They should be fully tested, and the results reported to this Bureau. It is further recommended that an equal number of intrenching-tools be made, to be carried by the soldiers, and be tried in comparison with the trowel-bayonet.

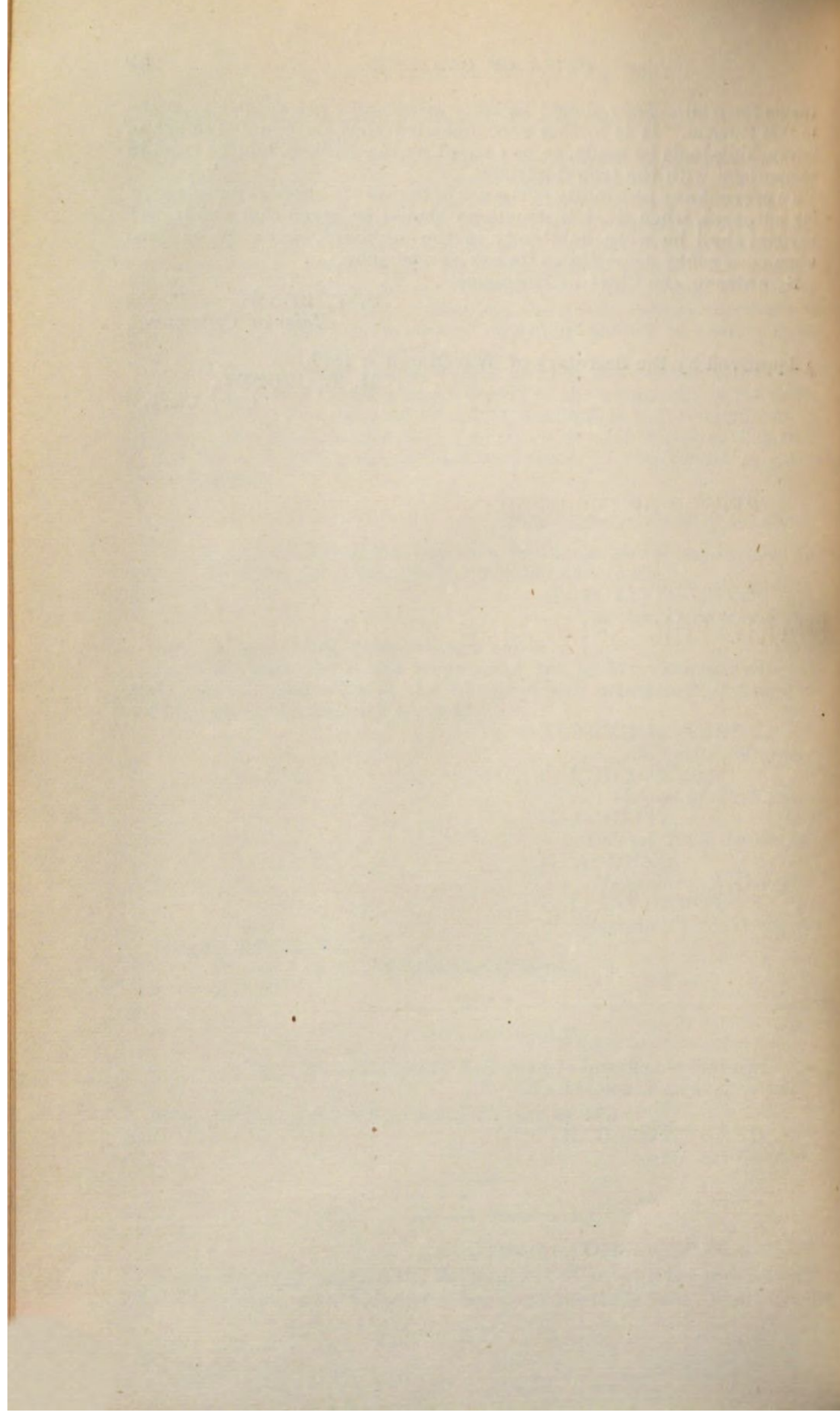
To prevent any possibility of the use of the trowel-bayonet for intrenching purposes, when *fixed*, instructions should be given that the trowel-bayonet shall be worn habitually in the scabbard, and only be fixed when emergency necessitates its use as a weapon.

By order of the Chief of Ordnance.

S. V. BENÉT,
Major of Ordnance.

Approved by the Secretary of War March 7, 1873.

H. T. CROSBY,
Chief Clerk.



I.

RECORD OF PROCEEDINGS AND ADJOURNMENTS
OF THE
BOARD FOR SELECTING A BREECH-SYSTEM
FOR THE
MUSKETS AND CARBINES OF THE MILITARY SERVICE,
APPOINTED BY
GENERAL ORDERS No. 58, ADJUTANT GENERAL'S
OFFICE, SERIES OF 1872.

RECORD.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
National Armory, Springfield, Massachusetts, May 10, 1873.

SIR: I have the honor to transmit herewith, by express, the addenda I, II, and V, referred to in the report of the Board for the selection of a breech-loading system for muskets and carbines, and in the letter accompanying the report, dated May 5, 1873. The other addenda will be forwarded as rapidly as they can be prepared.

Very respectfully, your obedient servant,

HENRY METCALFE,
Lieutenant of Ordnance, Recorder.

The Hon. the SECRETARY OF WAR,
(Through the Adjutant-General United States Army,)
Washington D. C.

Proceedings of a Board for the examination of small-arms, convened at New York, September 3, 1872, by authority of the following order:

[General Orders No. 58.]

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE,
Washington, June 28, 1872.

The following is an extract from section 1 of the "act making appropriations for the support of the Army for the year ending June 30, 1873, and for other purposes," approved June 6, 1872:

"For manufacture of arms at the national armory, one hundred and fifty thousand dollars: *Provided*, That no part of this appropriation shall be expended until a breech-loading system for muskets and carbines shall have been adopted for the military service, upon the recommendation of the board to be appointed by the Secretary of War, which board shall consist of not less than five officers, as follows: One general officer, one ordnance officer, and three officers of the line, one to be taken from the cavalry, one from the infantry, and one from the artillery: *And provided further*, That the system, when so adopted, shall be the only one to be used by the Ordnance Department in the manufacture of muskets and carbines for the military service; and no royalty shall be paid by the Government of the United States for the use of said patent to any of its officers or employés, or for any patent in which said officers or employés may be directly or indirectly interested."

In conformity with the above provisions, a board will assemble in the city of New York, on the 3d day of September, 1872, with authority to adjourn to Springfield Armory, in order to avail itself of the resources of that establishment, which are hereby placed at its disposal, to consider and recommend for adoption a breech-loading system for muskets and carbines for the military service.

Detail for the board.—Brigadier-General A. H. Terry, United States Army; Colonel P. V. Hagner, Ordnance Department; Colonel H. B. Clitz, Tenth Infantry; Major M. A. Reno, Seventh Cavalry; Captain L. L. Livingston, Third Artillery.

Second Lieutenant Henry Metcalfe, Ordnance Department, is detailed as recorder of the board.

All persons interested in small-arms are invited to submit samples and appear in person, under such rules as may be adopted by the board.

The Ordnance Bureau will supply such information bearing on the matters under investigation as may be called for by the board.

By order of the Secretary of War:

E. D. TOWNSEND,
Adjutant-General.

Official:

WM. D. WHIPPLE,
Assistant Adjutant-General.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 3, 1872.

The Board met pursuant to the above order.

Present: Colonel Hagner, Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

The senior member present having received a telegram from General Terry stating his inability, from having missed railroad connections, to be present to-day, the Board adjourned until to-morrow, the 4th instant, at 11 a. m.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 4, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Communications from Messrs. A. M. McWhorter, G. D. Luce, W. R. Evans, S. F. Van Choate, General M. C. Meigs, and Lieutenant E. Rice, received by General Terry before the meeting of the Board, and unanswered by him, were then presented and read. Awaiting further action by the Board they were filed unanswered, except that a reply was sent to that received from Lieutenant Rice.

The recorder submitted a correspondence with Messrs. T. Poultney, Oscar Snell, and E. Sleeper, presenting in behalf of the latter a wooden model, with specifications, which were filed.

The Board applied to the Chief of Ordnance for reports on breech-loading small-arms from the field and from the boards of which Generals Hancock and Schofield were presidents, together with such other ordnance memoranda as detail proceedings of boards on small-arms or parts of small-arms.

A petition from Messrs. W. G. Ward, E. Remington, and others, that the Board conduct its experiments at Creedmoor, Long Island, was received and placed on file.

The Board adopted the following notice, which was ordered to be published, regulating the reception of samples and communications, and appointed its hours of sitting, daily, from 10 a. m. to 3 p. m.

OFFICE OF THE BOARD ON SMALL-ARMS, FOURTH STORY, ARMY BUILDING,
Corner of Houston and Greene Streets, September 4, 1872.

Notice is hereby given to all persons who desire to submit samples, or to appear in person before the Board, that it is now in session at the above-named office.

All written communications will be addressed to the recorder of the Board, and samples of arms will be received at the Board-rooms between the hours of 10 and 3, daily, until further notice.

HENRY METCALFE,
Second Lieutenant Ordnance, Recorder.

Mr. J. W. SIMONTON,
Agent Associated Press, present.

There being no further business the Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 5, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The following rule was adopted for the reception of guns:

Upon receipt of the gun let the inventor explain it, take it apart, distribute parts to members for examination, and *when upon request* assemble it, and show general mechanical movements and advantages claimed; then leave the gun for the Board.

And also the following general tests for the arms presented for examination :

BEFORE FIRING—

1st. Examine the mechanical construction, facility and rapidity of dismounting and re-assembling.

2d. Facility of loading and extracting shells.

3d. Effect of dust in impeding the mechanism.

4th. Effect of water and consequent rust on mechanism.

AFTER THE ABOVE—

5th. Rapidity of fire, at will and from the shoulder.

6th. Accuracy of fire, at will and from the shoulder.

7th. Effect of dust and rust upon rapidity and accuracy.

8th. Effect of defective ammunition.

9th. Effect of overcharges and firing with dirty bore.

10th. Number of parts, simplicity in assembling, and liability of detached parts to loss and breakage.

Also such other tests by firing and exposure as the Board may desire to apply.

The notice intended for publication in the morning papers, which, from want of time, had to be intrusted to the courtesy of the press, having failed to appear, and no arms being ready for examination, the Board adjourned.

OFFICE OF BOARD ON BREECH-LOADING SMALL-ARMS,

Army Building, New York City, September 6, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board directed a request to be made of the Chief of Ordnance for a description of the breech-loading small-arms made or altered at the National Armory within the past few years.

General B. S. Roberts presented a breech-loading musket of his invention, which was examined by the Board. The lock was found to contain 8 pieces, and the movable parts of the system to include 5 others. (The latter were assembled in 44 seconds and stripped in 55 seconds.)

Mr. W. R. Evans presented a magazine-carbine, for holding 38 cartridges; it was charged in 60 seconds, the magazine emptied in 15 seconds, and 38 shots fired in 27 seconds. The gun was removed by the inventor to be replaced by another of different caliber.

The Board decided upon a form to be filled up by persons presenting samples for its examination; when, having no further specimens of arms before it, it adjourned till Monday, the 9th instant, at 11 a. m.

OFFICE OF BOARD ON BREECH-LOADING SMALL-ARMS,

Army Building, New York City, September 9, 1872.

The Board met pursuant to adjournment.

Present: General Terry, Colonel Hagner, Major Reno, Captain Livingston, and the recorder.

Absent: Colonel Clitz.

Mr. G. W. Yale, on behalf of the Sharps Rifle Manufacturing Company, presented a breech-loading rifle, which was dismantled and discussed by the Board.

Letters were received from the Chief of Ordnance, transmitting papers on the trowel-bayonet, with indorsements by the Secretary of War, inclosing a descriptive compilation asked for September 6, with a table of changes in the Springfield musket; and inclosing letters from Messrs. C. B. Norton, Thos. C. Johnston, E. Whitney, M. F. Benton, Wilhelm Bessler, and Quartermaster-General Meigs. Letters were also received from Messrs. J. L. Kirk and F. W. Worrell, the latter being accompanied by a wooden model, all of which were placed on file.

The Board directed answers to be sent to Messrs. J. L. Kirk and M. F. Benton, and that Lieutenant Rice be informed, in answer to his letter of the 22d ultimo, that the Board was now ready to consider his invention, authority to that effect having been received.

Having no other specimens of arms before it, the Board then adjourned.

OFFICE OF BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 10, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Letters from Messrs. Oscar Snell, M. F. Benton, and E. Whitney, the last two transmitting specimens of arms, were read, and a reply ordered sent to Mr. Snell.

The following resolution was adopted, which was ordered to be communicated by the president to the National Rifle Association:

Resolved, That the president be requested to return the thanks of the Board to the officers of the National Rifle Association, who have been kind enough to offer us the use of their target-grounds in the neighborhood of this city, and to inform them that, in the opinion of the Board, it will be more convenient and advantageous for the performance of the duties assigned to them to make use of the ground and conveniences already prepared for them at the Springfield Armory.

Mr. Whitney presented four Whitney rifles, and Mr. J. D. Greene one rifle, which were examined and discussed by the Board.

Having no other specimens of arms before it, the Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 11, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Letters were received from the Chief of Ordnance, transmitting documents asked for September 4, and from Lieut. Col. B. S. Roberts, and the Boyd Breech-Loading Arms Company, to which answers were ordered to be sent.

The Peabody and Wohlgemuth guns were examined and discussed.

There being no other arms present for examination, the Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 12, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The following resolution was adopted:

Resolved, That when this Board adjourns at the close of its session on the 27th instant, it will adjourn to meet in Springfield, Massachusetts, on the 7th October.

Which was directed to be communicated to Colonel F. M. Peck, with a view to its insertion in the daily papers.

There being no guns before it for examination, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 13, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Broughton, Whitney, and Scott guns were examined and discussed, as were also specimens of the Martini-Henry, Chassepot, Mauser, Werndl, Wanzel, Snider, and Vetterli arms, presented through the courtesy of Colonel Crispin, Ordnance Department, to the attention of the Board.

There being no guns before it for examination, the Board adjourned till Monday, the 16th inst., at 10 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 16, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

No guns being presented for examination, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 17, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Five specimens of the Remington gun and one Elliot gun were presented by the owners, and examined by the Board.

There being no other guns before it for examination, the Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 18, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

There being no specimens of arms before it for examination, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 19, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

At the request of Mr. Whitney, the Board permitted his model of cal. .43, and entered on the docket as gun No. 12, to be taken away by him.

O. F. Winchester, esq., exhibited his breech-loading and magazine rifle, which was partly examined and returned to him.

A. T. Freeman presented his breech-loading rifle, known as the Freeman rifle, which he dismounted, re-assembled, and explained to the Board, leaving it with them for experiment.

General W. G. Ward presented samples of the Ward-Burton rifle and carbine, which he dismounted and left with the Board for experiment.

General B. S. Roberts also presented a breech-loading carbine as above.

There being no other arms for examination, the Board adjourned, to meet at 11 a. m. to-morrow.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 20, 1872.

The Board met pursuant to adjournment.

Present: General Terry, Colonel Hagner, Colonel Clitz, Major Reno, Captain Livingston.

Absent: The recorder, by permission of the Board.

The Board received from the Union Metallic Cartridge Company a sample card, the receipt of which was acknowledged by mail.

The Board then adjourned to meet on Monday next, the 23d instant, at 11 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 23, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board examined the changes made in the Broughton gun to prevent its discharge at half-cock. It reconsidered its resolution of the 12th instant, and changed the day of meeting in Springfield from the 7th to the 9th proximo.

There being no guns before it for examination, the Board then adjourned till to-morrow at 11 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 24, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

First Lieut. E. Rice, Fifth United States Infantry, presented samples of trowel-bayonets, which were examined and considered by the Board.

There being no other arms before it for examination, the Board adjourned till 10 a. m. to-morrow.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 25, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Specimens of arms were presented by Messrs. C. M. Spencer, E. Remington & Sons, W. S. Smoot, and William Morgenstern, and were examined and discussed by the Board; when, having no other specimens of arms before it, the Board adjourned till to-morrow at 10 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 26, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry, by permission of the Board.

No specimens of arms being presented for examination, the Board adjourned till to-morrow at 10 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, September 27, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry, by permission of the Board.

In conformity with the authority given in General Orders No. 58, current series, Adjutant-General's Office, Washington, D. C., the Board then adjourned to meet at Springfield Armory, October 10, 1872.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, October 10, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

A telegram was received from General Terry stating his necessary detention on official business.

The Board then proceeded to discuss and make a few preliminary experiments with the Evans repeating rifle and with Lieutenant Rice's trowel-bayonet, when, having no other specimens of arms before it, the Board adjourned to meet to-morrow at 10 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 11, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Captain Livingston, and the recorder.

Absent: General Terry, detained in his command by important public business, and Major Reno, by permission of the Board.

Messrs. Snell, Robertson, Van Choate, and Captain J. M. Whittemore presented samples of arms, which were examined and discussed.

Messrs. Snell and Evans removed their specimens for replacement by more perfect models.

Lieutenant Rice, United States Army, presented specimens of the Merrill handle for bayonets.

The Board adjourned to meet October 16 at 10 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 16, 1872.

The Board met pursuant to adjournment.

Present: General Terry, Colonels Hagner and Clitz, and the recorder.

Absent: Major Reno and Captain Livingston.

Mr. Chillingworth presented samples of trowel and triangular bayonets fitted with his handle, and Messrs. Smith and Chamberlain presented a specimen of their arm, known as the "Dexter" gun; these were examined and discussed by the Board.

Capt. J. M. Whittemore withdrew his sample from competition.

The Board then adjourned till to-morrow at 10 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 17, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Lieut. E. Rice submitted letters from officers of the Army concerning his trowel-bayonet, which were read before the Board.

Mr. B. F. Joslyn submitted the Joslyn-Tomes gun, which was examined and discussed.

The Board then discussed a series of rules for the trial of arms before it, and proceeded to further trial of the trowel-bayonet fitted with Chillingworth's handles.

The Board then adjourned till to-morrow at 10 o'clock.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 18, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board discussed and adopted the following rules:

TESTS FOR A GUN WHICH THE BOARD HAVE DECIDED TO SUBJECT TO
TRIAL.

The piece to be first fired ten rounds by the exhibitor, or with a lanyard, as a test of safety.

The firing to be then continued according to the rules annexed, by an employé of the Armory, or soldier detailed by the War Department. The record to be based upon this firing, though exhibitors may have the privilege of displaying the powers of their guns if desired, and of having their performance noted in the record.

The service-cartridge to be used in all cases where the gun is chambered for it, except in the special trials made by exhibitors.

No persons will be admitted to the firing-ground but the agents or exhibitors of the gun immediately under trial, and such other persons as may be specially invited by the Board.

TESTS.

I. *Rapidity with aim.*—The number of shots which, fired in one minute, strike a target 6 feet by 2 feet at a distance of 100 feet. Any cartridges missing fire in this or other tests to be tried with a prick-punch, or opened to ascertain the cause of failure. The test to be begun with an empty chamber or magazine, the cartridges to be disposed at will on a table.

II. *Rapidity at will.*—The number of shots that can be fired in one minute, irrespective of aim.

III. *Endurance*.—Each gun to be fired 500 continuous rounds, without cleaning. The state of the breech-mechanism to be examined at the end of every 50 rounds.

IV. *Defective cartridges*.—Each gun to be fired once with each of the following defective cartridges: 1. Cross-filed on head to nearly the thickness of the metal. 2. Cut at intervals around the rim. 3. With a longitudinal cut the whole length of the cartridge from the rim up. A fresh piece of white paper marked with the number of the gun being laid over the breech to observe the escape of gas, if any occurs.

V. *Dust*.—The piece to be exposed in a box prepared for that purpose to a blast of fine sand-dust for 2 minutes; to be removed, fired 50 rounds, replaced for 2 minutes, removed and fired 50 rounds more.

VI. *Rust*.—The breech-mechanism and receiver to be cleansed of grease and the chamber of the barrel greased and plugged, the butt of the gun to be inserted to the height of the chamber in brine for 10 minutes, exposed for two days to the open air standing in a rack, and then fired 50 rounds.

VII. *Excessive charges*.—To be fired once with 85 grains of powder and one ball of 450 grains of lead; once with 90 grains and one ball; and once with 90 grains and two balls. The piece to be closely examined after each discharge.

And decided to test the following guns among those submitted for its action:

Nos. 2 and 28. Roberts;
 No. 4. Evans;
 No. 5. Sharps;
 Nos. 7, 8, and 9. Peabody;
 Nos. 10, 11, 12 and 13. Whitney;
 No. 14. Greene;
 No. 15. Morgenstern;
 No. 18. Broughton;
 Nos. 19, 20, 21, 22 and 23. Remington;
 No. 24. Elliot;
 No. 25. Freeman;
 Nos. 26 and 27. Ward-Burton;
 No. 30. Spencer;
 No. 31. Remington bolt-gun;
 No. 32. Smoot;
 No. 34. Van Choat
 No. 35. Robertson;
 No. 38. Dexter;
 No. 40. Joslyn-Tomes.

It was decided not to test the following arms:

No. 1. Sleeper;
 No. 3. Scott; (to be set aside.)
 No. 6. Worrell;
 Nos. 16 and 17. Wohlgemuth;
 No. 33. Snell, which was withdrawn;
 No. 36. Whittemore, withdrawn;
 No. 37. Kirk.

The Board then adopted the following hours for its sessions, viz: 9 a. m. to 12½ p. m., 2½ p. m. to 4½ p. m., and directed that there should be sent to the agents of the Sharps, Whitney, and Roberts guns copies of their rules, with an intimation of their readiness to test their guns on Tuesday next, the 22d instant, and that the Peabody gun be tried on Monday, the 28th instant.

The Board then agreed to the following resolution:

Resolved, That the commanding officer of the Armory be requested to submit to the Board, for experiment, samples of the breech-loading muskets and carbines of the patterns made at Springfield and now in use in the field, and referred to in the reports from company commanders

now before the Board; also such other models of breech-loading arms as have been made at the Armory and have been subjected to trial.

The Board then requested Major Benton, commanding, to provide them with the services of a clerk.

The Board then adjourned till Monday next.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 21, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

A telegram was received from the Secretary of War, authorizing the absence of General Terry, and directing the Board to proceed without him.

The question of voting on the trowel-bayonet was then discussed, and it was decided to postpone a final decision until the arrival of General Terry.

The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 22, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

The Board proceeded to the test of the Sharps rifle, with the results noted in the journal.

The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 23, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

The Board then proceeded to the test of the Sharps and Roberts rifles, and agreed to substitute for "brine," in Test VI, the words "a solution of sal-ammoniac;" and also to forbid the handling of guns by their representatives at any time after the preliminary test for safety.

The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 24, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

The Board decided to make Test IV on the present list No. 1, and to let the other tests follow in their present order, substituting for "50 rounds" in Tests V and VI, "20 rounds" in each case.

It was decided to refuse the application of General Roberts, whose gun broke in firing yesterday, to have it restocked for a continuation of the trial.

The trial of the Dexter gun was then gone on with, after which the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 25, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry.

The Board examined a wooden model of an improvement on the Springfield musket, model 1870, presented by the master armorer, Mr. E. S. Allin, and decided to request permission of the Secretary of War to have a working model made here for trial.

It examined an improvement of the Chillingworth bayonet-handle, designed to prevent loss of parts.

The trial of the Remington muskets was set for Monday next, the 28th instant.

The Board then proceeded with the trial of the Sharps rifle; after which it adjourned till Monday next, at 9 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 28, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board then proceeded to complete the trial of the Dexter gun, and to the test of the Peabody musket, and of the two Remington arms, numbered on the docket 19 and 20.

The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 29, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board proceeded to the trial of the Peabody musket and of the Remington muskets 19, 20, 21, 22, 23.

The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 30, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

On the application of Lieut. Col. B. S. Roberts, United States Army, (retired,) the Board granted him permission to withdraw his musket disabled October 23, and to substitute for it a carbine of the same general design.

The Board then proceeded to the trial of the Remington muskets numbered 21 and 23, the Spanish model (Remington) No. 41, and the Smoot musket.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, October 31, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The application of Lieut. Col. B. S. Roberts to have his broken gun restocked at the public expense was refused, and the trial of the Broughton gun set for Tuesday, November 12.

The Board then proceeded to the trial of the Smoot and Peabody muskets, and of the Remington arms Nos. 19, 20, and 41; after which it directed the trial of the Smoot arm and Remington 21 and 41 arms on the 11th proximo, and set the trial of the Broughton, Greene, Remington, and Morgenstern arms for on or after Tuesday, the 12th proximo.

Having then completed all the business ready for its action, and having been notified that those called upon desired to be excused from attending during the coming week, the Board adjourned till Monday, the 11th proximo, at 2.30 p. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 11, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board examined the Updegraff arm, and proceeded to the trial of the Remington 21 and 41, and the Smoot gun; after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts November 12, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and the recorder, who was absent by permission of the Board.

The Remington gun No. 23 was authorized to be withdrawn to be fitted with a dog-spring, in the place of one broken October 30. Owing

to lack of transportation to the water-shops, it was decided to defer Tests II, III, and V till a more convenient occasion.

The Board proceeded to test the Remington 22 and 43, the Thomas gun, the Broughton 18 and 45, and the Updegraff gun, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 13, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board adopted the following rule :

After the rusting test the guns may be cleaned in the shop; prior to that no one should clean them but the employé. The only cleaning requisite during the experiments, and prior to rusting, is to oil and wipe the breech-mechanism, and wipe out the barrel. No cleaning or wiping should be done during the experiments, unless in the presence of the Board, or by special direction.

And proceeded with the trial of the arms known as the Thomas, Remington 22 and 43, Morgenstern, Broughton, 18 and 45, and Updegraff after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 14, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

It set the trial of the Whitney arms for Tuesday next, November 19, and proceeded to the trial of the arms known as the Updegraff, Broughton 18 and 45, Greene, Thomas, and Remington 43, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 15, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

It set the trial of the Ward-Burton arms for Tuesday next, and of the Joslyn-Tomes for Wednesday next.

It then proceeded with the trial of the arms known as the Greene, the Remington 22 and 43, the Thomas, the Updegraff, the Broughton 18 and 45, after which it adjourned till Monday morning at 9 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 18, 1872.

The Board met pursuant to adjournment.

Present: All the member except General Terry and Colonel Hagner, and present the recorder.

The Board proceeded to test the arms known as the Remington 22 and 43, the Thomas, Broughton 18 and 45, the Updegraff, and the Greene, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 19, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder; and proceeded to test the Whitney arms 11 and 13, the Spencer, and the Robertson.

Mr. Robertson was allowed to withdraw his arm for the purpose of altering it to fire the United States service ammunition.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 20, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

It went on with the test of the Spencer and Whitney arms 11 and 13.

It was resolved, That the Westley Richards arm being, in the opinion of the Board, of a model unsuitable for military service, it be not subjected to trial, and that the Greene, Thomas, and Remington No. 23 arms having failed to withstand the tests to which it was decided to subject all guns, the Board is of opinion that these models of guns are not suitable for military service.

It was further resolved, That the Chillingworth bayonet-shank be subjected to the rusting process which is applied to the arms before the Board, and then examined to determine whether it can be easily fixed and unfixed.

The question of the adoption of the trowel-bayonet was discussed by the Board, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 21, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder, and proceeded with the trial of the Springfield, Joslyn-Tomes, and Schofield's improved Remington arms, the trial of the last two of which was temporarily postponed, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, November 22, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder, and proceeded with the trial of the Spencer and Whitney arms Nos. 11 and 13.

It was resolved, That the Board recommend to the War Department

that Rice's trowel-bayonet with the Chillingworth attachment be adopted for the use of the military service.

It was further resolved, That all persons whose arms have been before the Board and have not been tested, be notified to be present here December 3d next.

After which the Board adjourned to meet December 2, at 2½ p. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 2, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board proceeded to test the Springfield and Van Choate arms, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 3, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board proceeded to test the Ward-Burton and Van Choate arms, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 4, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board proceeded to test the arms known as Milbank 50 and 51, and Stetson, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 5, 1872.

The Board met pursuant to adjournment.

Present: Colonels Hagner and Clitz, Major Reno, and the recorder.

Absent: General Terry and Captain Livingston.

The Barnekov-Greene gun was exhibited by Mr. Greene, and discussed by the Board.

This arm, the Stetson magazine-gun, the Milbank boat-gun, were decided by the Board as being of models unsuited for the military service, and were consequently set aside for consideration by the full Board.

Mr. Milbank and Mr. Lee withdrew their bolt-guns presented and partly tested yesterday.

The Board then proceeded with the test of the Lee, Robertson, Freeman, and Milbank arms, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 6, 1872.

The Board met pursuant to adjournment.

Present: Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry, on public business, and Colonel Hagner, who was called away by a death in his family.

The Board proceeded to try the Ward-Burton, the Elliot, the Freeman, the Robertson, and the Lee arms, after which it adjourned till Monday, the 9th instant.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 9, 1872.

The Board met pursuant to adjournment.

Present: Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry and Colonel Hagner.

The trial of the Elliot and Freeman arms was continued; after which the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 10, 1872.

The Board met pursuant to adjournment.

Present: Colonel Clitz, Major Reno, Captain Livingston, and the recorder.

Absent: General Terry and Colonel Hagner.

The Board examined the Miller carbine presented by Mr. Helm, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 11, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board examined the Miller carbine, and decided that, on account of its manifest unsuitability for the military service, it be set aside for consideration by the full Board, after which it adjourned until December 13.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 13, 1872.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The tests of the Freeman gun were completed; after which the Board adjourned till Monday, 16th instant.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 16, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Allin modification of the Springfield musket, and a model devised by Mr. James Stillman, were examined and discussed by the Board, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 17, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

They examined the Mont-Storm system, and a magazine-carbine and other models on the Ward-Burton plan, and continued the trial of the Allin modification of the Springfield and the Russian-Berdan gun.

Mr. Muir, agent of the Mont-Storm gun, withdrew the model to change it to .50 caliber.

It was resolved, 1st. That when the Board adjourn on Friday next it be until Monday, January 6; 2d. That the commanding officer of the armory be requested to prepare for the Board a working-model on the plan recently presented to the Board by Mr. James Stillman, master-stocker; 3d. That notwithstanding the existing crack in the chamber of the Allin gun, the tests be continued with it in its present condition.

The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 18, 1872.

The Board met pursuant to adjournment.

Present: All the members, and present the recorder.

Action in the matter of the Stillman gun was postponed until further experiments had been made with the plan proposed by Mr. Allin.

The cartridges for the Ward-Burton magazine-arm not being ready, its trial was fixed for Tuesday, January 7.

Permission was refused Mr. Allin to withdraw his gun and re-enter it with a perfect barrel until after its exposure to the rusting test.

The Board then proceeded to the trial of the Peabody and Ward-Burton arms, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 19, 1872.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Under authority from the Secretary of War, Mr. Whipple, agent of the Ward-Burton arm, was allowed to examine the reports from the field concerning that system.

The Board examined a carbine on the Elliot principle, which was withdrawn for alteration, allowed General Roberts a postponement of the trial of his gun until after their next meeting, and proceeded to test the Lee guns Nos. 54 and 61, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, December 20, 1872.

The Board met pursuant to adjournment.

Present: All the members, and present the recorder.

Mr. Allin was allowed to replace his barrel by a new one; and it was ordered, owing to the insufficient deposit of rust on his arm, that it should be exposed to the test a second time.

It was resolved, That the commanding officer of the Armory be requested to prepare, during the recess of the Board, a working-model of a gun on the plan submitted by Mr. James Stillman, master-stocker.

After having completed the test of the Russian-Berdan arm, the Board adjourned till January 6, at 2½ p. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 6, 1873.

The Board met pursuant to adjournment.

Present: Major Reno and the recorder, the rest of the Board being detained by the snow.

The Board then adjourned till to-morrow.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 7, 1873.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

The Board appointed the 9th instant for the trial of the new Remington-Ryder arm, and proceeded to test the Joslyn-Tomes and Roberts arms, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 8, 1873.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

Mr. Conroy, of New York, presented a wooden model of an arm, and Mr. Funk, agent of the Earnest gun, submitted a sample of that arm, which were examined and discussed by the Board.

After testing the Joslyn-Tomes and Earnest guns, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 9, 1873.

The Board met pursuant to adjournment.

Present: All the members except General Terry, and present the recorder.

Mr. Gardner presented a model of his magazine-gun, adapted for sporting purposes, which was examined and discussed by the board.

The agent of the Remington arm having failed to keep the appointment made the 7th instant, the Board, after fixing Monday next for the trial of the Whitney carbine, adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 10, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board examined the alteration of the Springfield musket devised by Mr. Stillman, and a Remington-Ryder musket submitted by Mr. Ryder.

In consequence of the danger of accident to a number of ice-cutters just in range of the target, after completing the tests of the Lee No. 61 and Joslyn-Tomes arms, the Board adjourned till Monday next at 9½ a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 13, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board proceeded to test the Allin and Stillman modifications of the Springfield arm, the Remington-Ryder system No. 67, the Lee arm, No. 54, and the Roberts arm, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 14, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

It was resolved, That the Snell arm being, in the opinion of the Board, of a model unsuitable for the military service, it be not subjected to further trial.

The Board proceeded to the further test of the Joslyn-Tomes arm, after which it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 15, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Mr. Burgess exhibited a repeating carbine, cal. .44, which was examined by the Board. Owing to the insufficiency of the charge, no experiments were made with it, but Mr. Burgess left with the intention of making a model for a larger cartridge as soon as informed of the adoption of the pattern now under consideration by the Government.

After testing the Robertson arm the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 16, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The board discussed the question of selecting from those arms previously tried such systems as seem worthy of further experiment.

Mr. Lee exhibited the details of working and construction of his guns Nos. 54 and 61.

After completing the tests on the Remington-Ryder No. 67, Springfield with Stillman lock, Lee No. 54, and Roberts arms, the Board adjourned till 9.30 a. m., January 21.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 21, 1873.

The Board met pursuant to adjournment.

Present: All the members except Captain Livingston, and present the recorder.

An application from General Ward to postpone the trial of the Ward-Burton magazine-arm until February 4 was granted.

Mr. Muir, agent of the Mout-Storm arm, appearing with the same piece (cal. .58) presented December 17, and withdrawn for change to the service caliber, and stating that he had making a new arm of the proper dimensions, was informed that if his new arm should be ready in time for trial by the Board it would be tested, but that if it should not be presented in time notice would be given him of the approaching adjournment in season for the submission of the present arm.

The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 22, 1873.

The Board met pursuant to adjournment.

Present: All the members except Colonel Clitz and Captain Livingston, who were detained by sickness, and present the recorder.

There being no business before the Board, it adjourned until Tuesday, 28th instant, at 9.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 28, 1873.

The Board met pursuant to adjournment.

Present: All the members except Captain Livingston, and present the recorder.

The Board discussed the lock submitted by Mr. Merrill, and after further testing Mr. Milbank's bolt-gun No. 51, it adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 29, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Mr. Milbank dismounted and explained his gun partly tested yesterday.

The Board also examined the construction of the Earnest gun submitted by Mr. Funk.

After reading and approving the report of the Board on the trowel-bayonet, and declining the proposal made by the agent of the Snell gun January 16, concerning the testing of that arm, and at the request of the agent of the Earnest gun postponing its trial till to-morrow, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 30, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After the trial of the Earnest gun, which was withdrawn by the agent, the following resolution was adopted:

Resolved, That notice be given in both Springfield papers that the Board will act upon all guns presented before the 15th day of February, and that from and after that time the Board will devote itself to making up its report.

The following tests were adopted for the trial of such arms as might be reserved for further experiments:

1st. To be fired with two defective cartridges Nos. 1 and 2, and then to be dusted five minutes, the mechanism being in the mouth of the blow-pipe and closed, the hammer being at half-cock; then to be fired 6 shots, the last two defective Nos. 1 and 2, then without cleaning to be dusted with the breech open and fired 4 shots. The piece to be freed from dust only by pounding or wiping with the bare hand.

2d. To be rusted for 4 days after immersion as before and then fired 5 rounds with the service cartridge; then without cleaning to be fired 5 rounds with 120 grains powder and a ball weighing 1,200 grains; the gun to stand twenty-four hours after firing, without cleaning, and then to be thoroughly examined.

3d. Facility of manipulation by members of the Board.

An application from General B. S. Roberts desiring an interview with the Board to-morrow morning having been received and granted, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, January 31, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

General Roberts appeared before the Board and exhibited a breech-loading carbine on his plan and made a statement of the general advantages of the system.

The following resolution was passed:

Resolved, that the commandant of the armory be requested to supply a new stock for the gun of Brig. Gen. B. S. Roberts, No. 2, to replace the one broken October 23, during the test applied to it.

The Board examined a model of a magazine-arm submitted by Mr. Rumsey, of Washington, D. C., after which it adjourned till Tuesday, February 4, at 9.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 4, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board appointed the 5th, 6th, and 18th instants, respectively, for the trial of the Elliot, Freeman, and Kirk guns; and after testing the Ward-Burton magazing-carbine the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 5, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board examined new models of the Elliot, Roberts, Whitney, and Freeman guns.

General W. G. Ward exhibited different arms on the Ward-Burton system.

After applying to the Secretary of War for the decision of the Board for determining a proper caliber for small-arms, and testing the Elliot, Freeman, and Whitney arms, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 6, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board allowed Dr. Elliot and Mr. Freeman to remove their arms, Nos. 24 and 25, the former for the adaptation of a combined main and sear spring, to be returned in season for the rust-test on the 18th instant, and after further testing the Elliot and Freeman guns, adjourned to meet Tuesday, the 18th instant, at 9.30 o'clock a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 18, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Mr. Gardner appeared, and on giving an explanation of the difficulties he had found in completing his arm, was allowed until the 28th instant to finish it.

It was decided to appoint the 25th instant for the trial of the Conroy arm.

Mr. Spier submitted an arm, which he afterwards withdrew.

The Board decided to subject the following arms to the severer tests adopted January 30:

- Peabody, No. 64;
- Whitney carbine, No. 77;
- Springfield-Stillman;
- Elliot carbine, No. 80;
- Ward-Burton magazine;
- Updegraff;

Sharps, No. 5 ;
Remington-Ryder, No. 67 ;
Springfield, No. 69 ; (thin plate.)
Berdan-Russian ;
Freeman, No. 76 ;
Dexter ;
Lee, No. 61 ;
Roberts musket, No. 2 ;
and also to rust Dr. Elliott's gun for two days.
The Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 19, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After applying part of the regular tests to the Winchester No. 78, and Broughton Nos. 45 and 79 arms, and also submitting the Sharps No. 81, Dexter No. 38, and Elliot No. 80 arms to the first of the supplementary tests, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 20, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

It was resolved to subject the Remington locking-rifle, model 1872, and the Winchester and Broughton No. 79, to the supplementary tests, dispensing with those of a preliminary nature not yet endured.

It was also resolved to postpone the trial of the Conroy arm until the 26th instant.

After testing, under the ordinary rules, as far as test V, the Broughton No. 79 and the Winchester arms, and according to the supplementary tests the Updegraff, Roberts No. 2, Ward-Burton magazine-carbine, Freeman No. 76, and Russian-Berdan arms, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 21, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

It was resolved, That the Winchester and Sharps Rifle Manufacturing Companies be notified of the breaking of the lever and lever springs of their guns on the 19th and 21st instant, respectively, that they might have an opportunity of replacing them if desired.

It was also resolved, That the Sharps rifle No. 5 be subjected to the supplementary tests.

After subjecting the Broughton gun No. 45 to a second repetition of test No. VII, and exposing to the first supplementary test the Broughton No. 79, Remington-Ryder, Springfield No. 69, Remington locking-rifle No. 82, Springfield-Stillman, Peabody No. 63, Sharps No. 5, Whitney No. 77, and Lee No. 61, to await the rusting of the arms, the Board adjourned till Wednesday, February 26.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 26, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After subjecting to the second of the supplementary tests the

Elliot No. 80,
Remington-Ryder No. 67,
Remington locking-rifle No. 82,
Ward-Burton magazine-carbine,
Broughton No. 79,
Springfield No. 69,
Springfield-Stillman No. 66,
Lee No. 61,
Whitney carbine No. 77,
Peabody No. 63,
Roberts No. 2,
Sharps No. 5,
Russian-Berdan No. 57,
Freeman No. 76,
Updegraff No. 42, and
Dexter No. 38 arms,

and deciding to drop the Updegraff and Lee arms, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 27, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After examining the condition of the guns tested yesterday, and resolving to drop the Broughton No. 79 and Remington-Ryder No. 67 arms, and appointing to-morrow for the trial of the Merrill, Conroy, and Gardner arms, adding the Remington navy-rifle, and Remington rifle No. 19, with the Ryder power-extractor arms, to the list of those to be subjected to the supplementary tests, and selecting the Springfield No. 69, the Elliot No. 80, the Ward-Burton magazine-carbine, the Remington navy-rifle when supplied with the Ryder power-extractor, the Freeman No. 76, and Peabody No. 63 for adaptation to the barrel and ammunition recommended by the report of the Board for determining a proper caliber for small-arms, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, February 28, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Messrs. Merrill and Conroy explained their arms to the Board. The latter was withdrawn by the owner; the former was partly tested under the regular tests and withdrawn for alteration by the owner, and the Martini, Werndl, Remington navy, and Winchester arms under the first of the supplementary tests. The Werndl and Winchester arms were dropped as being disabled by the rust.

It was resolved to apply to the commanding officer of the armory for the alteration of the arms recommended yesterday for adaptation to the .45-cal. barrel.

The Board then adjourned until Tuesday next, 4th proximo, at 9.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Springfield, Massachusetts, March 4, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

It was resolved to transmit to the War Department the model of bayonet tested and recommended for adoption by the Board, in order to complete the record in connection with the subject of trowel-bayonets.

After examining the Martini and Remington No. 85 systems, after their exposure to rusting, and directing the recorder to request the commanding officer of the armory to prepare, during the recess of the Board, a suitable detachable magazine for the Springfield musket, or other single breech-loading small arms, the Board adopted the following resolution:

Resolved, That the Board adjourn to meet in the city of New York when notified by the recorder that certain work ordered to be completed at the armory is nearly ready for its examination, the Board to assemble in season for the preliminary trial of such arms as may be meanwhile submitted.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 1, 1873.

The Board met pursuant to the following call of the President:

ARMY AND NAVY CLUB,
New York, March 7, 1873.

SIR: I have learned from General Clitz the action of the Board in reference to its future meetings. After consultation with him, I have fixed upon Tuesday, the 1st day of April, as the time of its next meeting. Please notify the officers composing the Board of this time.

Very respectfully, your obedient servant,

ALFRED H. TERRY,
Brigadier-General and President of the Board.

Lieutenant HENRY METCALFE,
Recorder of Board on Small-Arms.

Present: All the members and the recorder.

The Board examined the alterations of the Remington gun with Ryder extractor No. 86, the Elliot and Freeman guns, also Lieutenant Metcalfe's arrangement of a detachable magazine, submitted among others by Major Benton, according to the request from the Board contained in a letter to him dated March 4, 1873.

Mr. Conroy presented an alteration of his former gun, to which it was decided by the Board to apply no further tests.

The Board then adjourned till to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 2, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board examined plans of detachable magazines submitted by Major Benton, and referred to in his letter of the 31st ultimo.

The Board then adjourned until to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 3, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board examined the altered model of the Peabody arm, and also a modification of the pattern before submitted by Mr. Whitney.

The Board then adjourned until to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 4, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board proceeded to test for rapidity of fire, with aim, taking the cartridges from the table, the following-named arms altered to cal. .45: Elliot, Remington No. 86, Remington No. 85, with Ryder extractor, Freeman, Springfield, and Peabody, with the results given in the journal.

It was then resolved to inform Messrs. Remington, Elliot, and Freeman of the defects of manufacture discovered in their arms, and to request them to have them corrected and returned before Monday at 11 a. m., until which hour the Board then adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 7, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Mr. Gardner presented the altered model of his repeating gun adapted to the Russian-Berdan cartridge, which the Board examined and proceeded to test with the results given in the journal.

The Board discussed the question of the supplementary tests to be applied to the altered guns, and as a preliminary to further action—

Resolved, That the following telegram should be sent to the commanding officer of Springfield Armory:

Can you give the Board any further information as to the time when the Ward-Burton gun will be finished? Please send on one thousand (1,000) more cartridges of forty-five caliber.

After which the Board adjourned till to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 8, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board proceeded to the discussion of the rules governing the trial of the arms altered to cal. .45, and adopted the following rules for those tests regarding the rapidity of fire, viz:

That the comparative rapidity of fire of each gun shall be determined by taking the average time of five successive trials, which shall be made by the same individual, at intervals of 20 minutes, and which shall consist of firing, with aim, from service cartridge-box No. 2, suspended from the waist-belt, 24 cartridges of cal. .45. The guns to be tested at the rate of one each working-day, and in the following order, determined by lot, viz:

- No. 1. Elliot,
2. Peabody,
3. Springfield,
4. Remington,
5. Freeman,

and the alteration of the Ward-Burton magazine-gun when completed.

The Merrill gun was further examined since its alteration by the exhibitor, but being, in the opinion of the Board, of a model unsuitable for military service, was not subjected to further trial.

The Board then adjourned until to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 9, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Mr. Lee having appeared before the Board, and having requested a copy of that portion of the journal having reference to the trial of his gun, the Board decided not to make public any part of their record until its promulgation by the proper authorities.

On Mr. Lee's application the commanding officer of Springfield Armory was requested to return him the broken parts of his gun No. 61.

The Board proceeded to test, for rapidity, the Elliot gun, with the result given in the journal.

The Board then adjourned until to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 10, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

On the application of Messrs. Hill and Hare, employés of the Board, it was decided to request the commanding officer of Springfield Armory to increase their extra compensation to the sum of \$2.50 per day, to take effect from March 29, the date of their arrival in New York on duty with the Board.

On the request of Mr. E. Whitney, that the Board should apply the

test with increased charges to a new model of his gun, it was decided that no particular test could be made of a gun which had not endured the trials of a preliminary nature, for which his application had not been made in time.

The alteration of the Peabody arm having been taken up for the test of rapid firing, it was found that the head of the firing-pin had been accidentally broken off; the arm was sent to the Peabody Arms Company for repair, and the alteration of the Springfield substituted in its place. After testing this arm, with the result given in the journal, the Board adjourned till Monday morning at 11 o'clock.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 14, 1873.

The Board met pursuant to adjournment.

Present: All the members except Colonel Hagner, and present the recorder.

After testing, for rapidity, the model of the .45-cal. Remington arm No. 86, with the results given in the journal, the Board adjourned till to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 15, 1873.

The Board met pursuant to adjournment.

Present: All the members except Colonel Clitz, and present the recorder.

After proceeding to the trial of the Freeman gun, with the results given in the journal, the Board adjourned till to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 16, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Mr. Muir presented a model of a gun, which was examined and discussed by the Board.

Mr. Whitney submitted his gun No. 77, altered by modifying the shape of the curve on the locking-brace, and the substitution of a friction-roll for the cam-lever, as well as by applying to it a barrel of cal. .45, to which he desired should be applied the usual supplementary tests.

After deciding to supply the place of the mainspring in the altered Springfield arm (cal. 45) by one of the standard weight of 75 pounds, that previously used having been inadvertently weakened in the manufacture to a weight of 65 pounds, (see Major Benton's letter of April 12, 1873,) and resolving to repeat to-day the test for rapidity with the arm, the Board adjourned, to wait the repairing of the Peabody arm, and the completion of the Ward-Burton magazine-musket, until Monday next at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 21, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After testing the Peabody arm, with the results given in the journal, the Board adjourned until to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 22, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After resolving to refuse the application made by Mr. Whitney on the 16th instant, and testing the Ward-Burton magazine-arm, with the results given in the journal, the Board adjourned until to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 23, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After testing the Ward-Burton magazine-arm, Lieutenant Metcalfe's detachable magazine, and Dr. W. H. Elliot's magazine cartridge-box, with the results given in the journal, the Board resolved to try the arms for facility of manipulation by persons not experts.

The Board also resolved to meet to-morrow, at 11 a. m., at the Battery, in order to proceed thence to Fort Columbus and continue with the trial as above stated.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 24, 1873.

The Board met pursuant to adjournment.

Present: General Terry, Colonel Hagner, Major Reno, Captain Livingston.

Absent: Colonel Clitz, from sickness, and the recorder, by permission of the Board.

The Board proceeded to Fort Columbus, Governor's Island, New York Harbor, where a party of 10 enlisted men, 5 of them old soldiers and 5 new recruits, were placed at their disposal by the commanding officer.

After completing the tests, with the results given in the journal, the Board adjourned till to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 25, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

Resolved, To return Dr. Elliot's gun to him to afford him an opportunity of correcting the defect found in the ejecting apparatus yesterday.

Awaiting this correction, the Board adjourned till Monday at 11 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 28, 1873.

The Board met pursuant to adjournment.

Present all the members and the recorder.

The Board discussed the results of the preceding experiments, and resolved to apply to the War Department* for the following information, as follows :

The ADJUTANT-GENERAL OF THE ARMY, *Washington, D. C. :*

The first vote taken in the Board on Breech-Loading Small-Arms, after the conclusion of its experiments, develops great differences of opinion among the members of the Board. May the Board recommend two or three systems, and also recommend their trial in the field before final adoption ?

By order of the Board :

ALFRED H. TERRY,
Brigadier-General.

After which, the Elliot gun not yet having been received, the Board adjourned until to-morrow at 10.30 a. m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 29, 1873.

The Board met pursuant to adjournment.

Present: General Terry, Colonel Hagner, Captain Livingston, and the recorder.

Absent: Colonel Clitz, from sickness, and Major Reno, by permission of the Board.

The Board received from Springfield Armory a Springfield musket, cal. .45, altered by Colonel Benton with the purpose of diminishing the difficulties found in the previous experiments for rapidity in entering the cartridge into the chamber in loading.

After experimenting with this arm, with the results noted in the journal, the Board adjourned.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, April 30, 1873.

The Board met pursuant to adjournment.

*The following is the telegram of the Adjutant-General of the Army in reply to the above inquiry :

[Telegram.]

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE,
Washington, April 29, 1873.

In reply to yours of yesterday, the Acting Secretary of War does not wish to decide the question, as the Secretary will return in a few weeks. With the approbation of the former, and of General Sherman, I say the act contemplates one system, and guns can only be made after its adoption. New action by Congress and new appropriations will be necessary to permit previous trials in the field. If it is hard for the Board to agree, much harder would it be to get a decision from various reports of different officers in the field.

E. D. TOWNSEND,
Adjutant-General.

General A. H. TERRY,
President Board on Small-Arms, New York City.

Present: General Terry, Colonels Hagner and Clitz, Captain Livingston, and the recorder.

Absent: Major Reno, by permission of the Board.

After discussing the results of the experiments, the Board adjourned until to-morrow at 10.30 a.m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, May 1, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

After discussing the results of the previous experiments—

Resolved, That the Board recommend that the barrels of muskets and carbines be browned before issue to the troops.

The Board then adjourned until Saturday morning at 10 o'clock.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, May 3, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The Board proceeded to discuss the form in which their opinion should be expressed in their report.

After further testing in Springfield and Elliot arms, trying the former in connection with Lieutenant Metcalfe's cartridge-holder, and deciding not to consider the subject of detachable magazines, the Board adjourned until Monday next at 12 m.

OFFICE BOARD ON BREECH-LOADING SMALL-ARMS,
Army Building, New York City, May 5, 1873.

The Board met pursuant to adjournment.

Present: All the members and the recorder.

The results of firing the Elliot and Springfield arms by a party of soldiers at Governor's Island were examined and approved.

After reading and signing the fair copy of the report adopted, the Board adjourned *sine die*.

HENRY METCALFE,
Second Lieutenant Ordnance, Recorder.

II.

SYNOPSIS OF THE EXPERIMENTS

MADE BY THE

BOARD FOR SELECTING A BREECH-SYSTEM

FOR THE

MUSKETS AND CARBINES OF THE MILITARY SERVICE,

APPOINTED BY

GENERAL ORDERS NO. 58, ADJUTANT-GENERAL'S
OFFICE, SERIES OF 1872.

- I.—REGULAR SERIES OF TESTS:
 - a.*—COMPLETED.
 - b.*—INCOMPLETE.
 - II.—SUPPLEMENTARY SERIES.
 - III.—FINAL SERIES.
-

REGULAR TESTS.

SAFETY TEST: TO BE FIRED 10 ROUNDS BY THE EXHIBITOR, OR WITH A LANYARD.

I.—*Defective cartridges.*

Each gun to be fired once with each of the following defective cartridges. 1. Cross-filed on head to nearly the thickness of the metal. 2. Cut at intervals around the rim. 3. With a longitudinal cut the whole length of the cartridge from the rim up. A fresh piece of white paper marked with the number of the gun being laid over the breech to observe the escape of gas, if any occurs.

II.—*Rapidity with accuracy.*

The number of shots which, fired in one minute, strike a target 6 feet by 2 feet at a distance of 100 feet. Any cartridges missing fire in this or other tests to be tried with a prick-punch, or opened to ascertain the cause of failure. The test to be begun with an empty chamber or magazine, the cartridges to be disposed at will on a table.

III.—*Rapidity at will.*

The number of shots which can be fired in one minute, irrespective of aim.

IV.—*Endurance.*

Each gun to be fired 500 continuous rounds, without cleaning. The state of the breech mechanism to be examined at the end of every 50 rounds.

V.—*Dust.*

The piece to be exposed in the box prepared for that purpose to a blast of fine sand-dust for 2 minutes; to be removed, fired 20 rounds, replaced for 2 minutes, removed and fired 20 rounds more.

VI.—*Rust.*

The breech mechanism and receiver to be cleansed of grease and the chamber of the barrel greased and plugged, the butt of the gun to be inserted to the height of the chamber in a solution of sal-ammoniac for 10 minutes, exposed for two days to the open air standing in a rack, and then fired 20 rounds.

VII.—*Excessive charges.*

To be fired once with 85 grains of powder and one ball of 450 grains of lead; once with 90 grains and one ball, and once with 90 grains and two balls. The piece to be closely examined after each discharge.

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SYNOPSIS.

I. REGULAR SERIES OF TESTS—(a) COMPLETED.

SHARPS RIFLE.

Using service-cartridges.

OCTOBER 22, 1872.

The safety-test was complied with.

I. No. 1. The paper was not soiled.

No. 2. Slight escape of gas above and below. Paper not torn.

No. 3. Strong escape of gas above and below. Paper not torn.

II. Twelve shots, 10 hits. Two shells extracted hard, the lever requiring a blow to start them; this was probably due to a slight deposit of rust in the chamber which had accumulated there since the presentation of the arm in New York.

III. Fifteen shots. One shell extracted hard. One cartridge was caught by slide in closing, but was inserted and fired. The thumb-nail of the operator was injured by catching in the lever while opening the breech. The lever-catch slipped forward occasionally and interfered with closing the breech.

IV. Four hundred rounds fired. The above trouble with the lever-catch found throughout the test.

OCTOBER 23, 1872.

Five hundred rounds were completed, the lever-catch giving the same inconvenience as above.

V. After the first exposure the breech opened very hard. Fifty rounds fired without failure.

OCTOBER 25, 1872.

After the second exposure the breech opened easily. Fifty rounds fired without failure.

VI. The gun, after dipping and exposure for forty-four hours, was found to be thoroughly rusted. The breech was opened with difficulty. Twenty shots were fired without failure. The lever required a sharp blow to extract the shells, the solution having slightly leaked into the chamber. After this was cleaned, the mechanism remaining rusty as before, one shot was fired and the shell extracted without the slightest difficulty.

VII. No. 1. Everything worked well.

No. 2. Same.

No. 3. Same.

The arm was then carefully examined and found uninjured in any of its parts.

OCTOBER 22, 1872.

Display.—To display the powers of the gun, Mr. Yale, the agent, fired 10 rounds with Martin's improved ammunition, manufactured by Sharps Rifle Manufacturing Company; everything worked well.

Under test II, he fired 13 shots, 12 hits.

Under test III, he fired 15 shots.

The arm worked well throughout.

DEXTER GUN.

Using the service-cartridge.

OCTOBER 24, 1872.

The safety-test was complied with; worked well.

I. No. 1. Strong escape above and on sides. Paper torn.

No. 2. Same.

No. 3. Slight escape on right side near where the slit was placed.

II. Eleven shots, 11 hits. Three shells required a blow to extract them.

III. Eighteen shots.

IV. Five hundred rounds fired without failure. Three cartridges burst in the head without affecting the piece or injuring the person firing, whose hand was exposed. After 350 rounds it was found that the rear side-screw had worked out, and that the lock-plate projected a trifle. These parts were replaced, and remained in position afterward.

V. After first exposure the piece worked freely, and twenty rounds were fired. After second exposure, same.

OCTOBER 28, 1872.

VI. After exposure the arm was found not very badly rusted, owing in part to the protection afforded by blueing. It opened easily and worked freely during the firing of 20 rounds. One cartridge missed fire, failed under the prick-punch, was opened and was found to have contained an insufficient quantity of fulminate.

VII. The three charges were fired without trouble, except that in the last the cartridge-head blew off, the lever sticking slightly in opening.

REMINGTON, No. 19.

OCTOBER 28, 1872.

The safety-test complied with; worked well.

I. No. 1. Strong escape above and to the right. Paper slightly torn.

No. 2. Strong escape above and to the right.

No. 3. Slight escape above and to the right.

II. Thirteen shots, 12 hits. The ejector worked badly. The shells often had to be picked out with the fingers.

III. Nineteen shots. The ejector failing in many cases to throw out the shells.

- IV. At first the ejector occasionally failed; it improved as the test went on till at the last it worked well. After the four-hundredth round it was discovered that the button-screw had worked loose. This was screwed home and retained its place afterward; otherwise everything worked well.

OCTOBER 29, 1872.

- V. Worked freely throughout the test.

OCTOBER 31, 1872.

- VI. One opened hard. Twenty rounds were fired, the hammer working hard throughout, the firer having to spit on the hammer to lubricate it.
- VII. In opening the breech after the last shot, the hammer worked very hard; otherwise everything worked well.

REMINGTON, No. 20.

OCTOBER 28, 1872.

The safety-test complied with. Everything worked well.

- I. No. 1. Escape of gas above.
No. 2. Escape of gas above.
No. 3. No escape of gas.
- II. Fourteen shots, 11 hits. Ejector worked very badly.
- III. Eighteen shots. The ejector worked very badly.
- IV. The ejector frequently failed; otherwise the arm worked well. One cartridge burst in the head, but did no harm. Immediately after the last shell was withdrawn, which stuck very badly, a Martin cartridge was fired and ejected with the greatest ease.
- V. Worked freely when empty, but extracted badly; otherwise worked well throughout the test.

OCTOBER 31, 1872.

- VI. Worked easily; fired 20 rounds without any trouble.
- VII. In opening the breech after the last shot, the hammer worked rather hard; otherwise everything worked well.

REMINGTON, No. 21.

OCTOBER 29, 1872.

The safety-test was complied with. Everything worked well.

- I. No. 1. Strong escape above and to the front. Paper was torn.
No. 2. Escape of gas above.
No. 3. Slight escape above.
- II. Eleven shots, 8 hits.
- III. Fifteen shots, besides one in chamber not fired.
- IV. Worked well throughout excepting the usual difficulty in extraction, which did not obtain when the Martin or Remington cartridges were used. During the third 50 rounds one head burst, doing no harm.

OCTOBER 30, 1872.

V. No. 1. Worked freely ; 20 shots fired without trouble ; one head burst.

No. 2. Worked freely ; 20 shots fired without trouble.

NOVEMBER 11, 1872.

VI. The breech opened very hard, although the hammer was snapped upon the firing-pin several times beforehand. Twenty shots were fired, the extractor working hard throughout.

VII. The three charges were fired without failure, the breech opening harder after the last shot than at any time since the rusting.

OCTOBER 30, 1872.

Display.—Mr. Bush, agent, using Remington brass cartridges, in 1 minute fired 18 shots at will ; one failed ; had no anvil. Using service-ammunition, he fired 19 shots at will.

REMINGTON, No. 22.

OCTOBER 29, 1872.

The safety-test was complied with. Everything worked well.

I. No. 1. Strong escape of gas above.

No. 2. Strong escape of gas above.

No. 3. No escape of gas.

II. Eleven shots, 10 hits.

III. Fifteen shots.

IV. First 50 rounds worked well. At their conclusion it was found that by a slight touch on the trigger, as the breech-block was closed, the hammer, though at half cock, would also fall ; this was claimed by the agent to be due to a defective shape of the half-cock notch, which, on his application, he was allowed to modify. In doing so, however, the mainspring broke from a fire-crack, and the arm was set aside.

NOVEMBER 12, 1872.

The mainspring broken October 29 having been replaced, the test was continued up to the two hundred and fiftieth fire without failure.

NOVEMBER 13, 1872.

The test was completed. Toward the last the hammer worked hard, and a few shells extracted hard. During the last 50 rounds one cartridge missed fire twice, but exploded under the prick-punch.

NOVEMBER 15, 1872.

V. Opened and worked freely throughout.

NOVEMBER 18, 1872.

- VI. Opened and worked freely throughout.
 - VII. Worked freely throughout.
-

SPANISH-REMINGTON, No. 41.

This arm was not chambered for the service cartridge, but used the Russian-Berdan ammunition, caliber .42.

OCTOBER 30, 1872.

Display.—The safety-test was complied with by Mr. Bush firing in one minute, at will, 21 shots, besides one in chamber not fired.

- I. No. 1. Strong escape above and below. Paper torn in two.
 - No. 2. Paper torn in pieces by gas.
 - No. 3. No escape of gas.
- II. Fifteen shots, 9 hits.

OCTOBER 31, 1872.

- III. Twenty shots, besides one in chamber not fired.
- IV. The gun worked well throughout.
- V. No. 1. The first cartridge was inserted with difficulty; 20 shots were fired without trouble.
 - No. 2. Worked well after exposure and while firing 20 shots.

NOVEMBER 11, 1872.

- VI. The breech opened very hard; 20 shots were fired; everything worked well.
 - VII. Nos. 2 and 3 missed fire, but exploded on the second trial. The hammer fell weakly as if impeded by rust.
-

REMINGTON, No. 43.

NOVEMBER 12, 1872.

The safety-test was fired by the agent.

- I. No. 1. Escape of gas above and on the side.
 - No. 2. Strong escape of gas above and on the side.
 - No. 3. No escape of gas.
- II. Twenty shots, 10 hits.
- III. Twenty-one shots.

NOVEMBER 13, 1872.

- IV. Three hundred rounds were fired. The extractor worked well. The test was completed. During the tenth 50 rounds one cartridge missed, but went on second trial.

NOVEMBER 15, 1872.

- V. Opened and worked well throughout.

NOVEMBER 1872.

- VI. Opened and worked freely throughout.
VII. Worked hard throughout, especially after third fire.
Display.—By Mr. Bush, 21 shots.

SMOOT.

OCTOBER 30, 1872.

- The safety-test was complied with; everything worked well.
I. No. 1. Escape of gas above.
No. 2. Escape of gas above.
No. 3. No escape of gas.
II. Fourteen shots, 13 hits.
III. Thirteen shots, 3 shells stuck hard.
IV. Nine cartridges burst in the head during this test, without, however, doing any harm. After the first 100 rounds the hammer was observed to rebound after striking. The system was examined and the mainspring stop-pin found to have worked down, and thereby to have impaired its action. This was remedied, and the firing went on. Toward the last the block occasionally stuck very hard in opening. This was found due to the burning of the cartridge-head into the firing-pin hole, which was so large as not to afford the necessary support.

OCTOBER 31, 1872.

- V. No. 1. Worked freely; 20 shots fired without trouble.
No. 2. Ground slightly in opening; 20 shots fired without trouble.

NOVEMBER 11, 1872.

- VI. The gun worked extremely hard, the foot having to be used to open the breech. Fired 20 shots, which were extracted with difficulty. A Martin cartridge was then fired and extracted a little more easily.
VII. The third discharge blew open the head of the cartridge near the top, where it was unsupported by the breech-block. The breech had to be opened with the foot.

PEABODY.

OCTOBER 28, 1872.

- The safety-test was complied with; everything worked well.
I. No. 1. A slight escape above.
No. 2. Strong escape in every direction, tearing the paper.
No. 3. Slight escape from below, on the right side.
II. Thirteen shots, 11 hits.
III. Seventeen shots; dropped one cartridge in loading.

- IV. Fired from a fixed rest, which interfered somewhat with the motion of the hand in opening the breech. During the eighth 50 rounds one head burst, the gas scorching the firer's face, although he was standing opposite the butt of the piece, an effect claimed by the agent to be due to his position, and not to be expected in the usual course of firing. In the ninth 50 rounds two cartridges extracted hard, the piece having to be removed from the rest to get one of the shells out. This was claimed by Mr. Peabody as due to the cup-anvil having been driven forward and wedged in the taper of the shell. Otherwise the arm worked well. (See record of incomplete tests, page 88.)

OCTOBER 29, 1872.

- V. Worked freely throughout the test.

OCTOBER 31, 1872.

- VI. Opened hard at first, but afterward worked freely ; fired 20 rounds without trouble.
VII. Everything worked well throughout the test.

BROUGHTON, No. 18.

NOVEMBER 12, 1872.

The safety-test was complied with.

- I. No. 1. Strong escape of gas above.
No. 2. Strong escape of gas above.
No. 3. No escape of gas.
II. Fifteen shots, besides one in chamber not fired, and one dropped in loading ; 10 hits.

NOVEMBER 14, 1872.

- III. Twenty-one shots, besides one in chamber not fired.
IV. Three hundred rounds were fired. The test completed.

NOVEMBER 15, 1872.

- V. Opened and worked freely throughout.

NOVEMBER 18, 1872.

- VI. Opened and worked freely throughout.
VII. Opened very hard ; after the third fire the cartridge-head was discovered blown off.

BROUGHTON, No. 45.

NOVEMBER 12, 1872.

The safety-test was complied with ; one cartridge missed fire, exploding afterward under a prick-punch.

- I. No. 1. Slight escape of gas from the side.
No. 2. Same.
No. 3. Same.

NOVEMBER 14, 1872.

- II. Fourteen shots, besides one dropped in loading; one missed fire, but went on the second trial; 11 hits.
- III. Ten shots, requiring a hard blow against the block every time to release the bolt.

NOVEMBER 13, 1872.

- IV. Three hundred rounds were fired; toward the last the bolt stuck badly in opening, the difficulty becoming greater as the test went on.

NOVEMBER 14 AND 15, 1872.

The test was completed. The arm opened very hard throughout, from the causes stated yesterday. When service-cartridges were used, the breech-block generally required a sharp blow with a stick to start it. With brass shells it worked freely.

- V. Worked easily, except when firing service-cartridges as before. The trouble found in this gun arose from the head of the cartridge swelling back against the breech-block, and thus keeping it tightly pressed against the firing-bolt, by which it is locked in place.

NOVEMBER 18, 1872.

- VI. Opened very hard; the bolt having to be kicked open, and the block struck a sharp blow with a stick to start it.
- VII. Opened very hard; after the third fire the cartridge-head was found split about the rim, and blown into the extractor-recess.

FEBRUARY 19, 1873.

With a clean gun. Returned after alleged correction of defects found in opening the breech, (*vide* November 18, *et ante*,) by beveling off the front of the hammer, so that it would not pinch after firing.

- VII. Nos. 1 and 2. Opened rather hard.
- No. 3. Head burst. The block had to be struck with a stick to liberate the hammer. Mr. Clark, the agent, claimed that this was due to the block not having been completely closed in the first instance.

FEBRUARY 21, 1873.

- VII. A clean gun. Repeated, owing to the request before mentioned of Mr. Clark, the agent.
- Nos. 1 and 2. Everything worked well except that the first of the 90-grain charges missed three times.
- No. 2. Stuck hard in opening, though not as badly as before.

UPDEGRAFF.

NOVEMBER 13, 1872.

The safety-test was complied with.

- I. No. 1. Escape of gas above and on the sides. The paper torn.
- No. 2. Strong escape of gas above. The paper was torn.
- No. 3. Very slight escape of gas.

NOVEMBER 14, 1872.

- II. Eighteen shots, 7 hits.
- III. Nineteen shots, besides one in chamber not fired.

NOVEMBER 13, 1872.

- IV. Two hundred rounds were fired. During the second 50 one cartridge missed, but went on second trial. During the fourth 50 two missed, but went on second trial. During the first 50 occasional difficulty was found in the automatic opening of the breech-block. This was remedied by allowing the point of the firing-pin to be ground off, so that it should project 0''.08 the usual distance, instead of 0''.13.

NOVEMBER 14, 1872.

Completed the test. During the sixth 50 rounds one cartridge missed fire, but went on the second trial. During the ninth 50 rounds one cartridge missed three times, but exploded under the prick-punch. Toward the last of the trial the piece opened very hard, a fact which was not observed when the Berdan brass shells were afterward tried.

NOVEMBER 15, 1872.

- V. Opened and worked freely throughout. After second dusting one cartridge missed fire, but exploded on the second trial.

NOVEMBER 18, 1872.

- VI. Opened very hard, and failed to perform its automatic functions until loosened by repeated working to and fro, moving very hard and imperfectly even then. Great difficulty was found in inserting the first cartridge, which required five blows to explode it. The third cartridge failed once, but went on the second trial. The extraction was very imperfect, force having to be applied to the breech-block with a stick.
- VII. No. 1. Missed once; fired on second trial.
- No. 2. Opened hard; had to use a stick.
- No. 3. Missed once; fired on second trial.

Opened so hard as to require a man's full strength, applied by means of a stick laid across the comb of the hammer. Mr. Updegraff was allowed to strip the gun, in order to ascertain the cause of its failure. The works generally were found well rusted. After drenching them with oil, and wiping off the breech-block thoroughly, the system worked better than before.

NOVEMBER 14, 1872.

Display.—By Mr. Updegraff; 21 shots.

WHITNEY, No. 11.

NOVEMBER 19, 1872.

The safety-test was fired by the agent.

- I. No. 1. Escape of gas above. Paper torn.
- No. 2. Escape of gas above and on sides. Paper torn to pieces.
- No. 3. Slight escape of gas.
- II. Sixteen shots, besides one in chamber not fired; 13 hits.
- III. Twenty-two shots.
- IV. Fired 400 rounds. During the second 50 rounds one case cracked longitudinally without doing any harm. After the fourth 50 rounds the hammer-pin screw was discovered loose, and the pin working out of place in consequence. The screw was turned home.

NOVEMBER 20, 1872.

Completed the 500 rounds.

- V. No. 1. Grated and worked imperfectly in opening, the breech-block not being thrown entirely back by its spring. On pulling the trigger when the hammer was down, it would catch on the inside of the guard-bow, and remain with the sear out of the notch until replaced.
- No. 2. Trigger caught repeatedly. The breech-block spring and ejector did not work effectively.
- VI. Opened and worked easily throughout.

NOVEMBER 22, 1872.

- VII. Worked easily throughout; at the third fire the cartridge-head blew off, doing the piece no harm.

NOVEMBER 20, 1872.

Display.—Using Berdan brass cartridges, one missed fire, but went on second trial; they extracted well, but were not ejected.

WHITNEY, No. 13.

NOVEMBER 19, 1872.

The safety-test was fired by the agent.

- I. No. 1. Escape of gas above. The paper was torn.
- No. 2. Escape of gas above and to the sides. Paper was torn.
- No. 3. A slight escape of gas above. The gas fouled the mechanism so that it worked very hard until it was cleaned.
- II. Eighteen shots, besides one in the chamber not fired. It was here discovered that the gun was unable to withdraw the loaded cartridge, which had therefore to be fired. Fifteen hits.
- III. Twenty-two shots, besides one in chamber not fired.
- IV. Fired 400 rounds. The extractor worked badly, often failing to withdraw the shells more than $\frac{1}{4}$ inch. Although, at the agent's request, the extractor-screw was several times loosened, its ac-

tion was not improved. After the first 50 rounds the firing-pin was found to project slightly, and was filed off to the proper length. It happened several times that the hammer was not caught, as designed, on the safety-notch. During the fifth 50 rounds one cartridge missed fire three times, but exploded under the prick-punch.

NOVEMBER 20, 1872.

Completed the 500 rounds. The extractor worked badly, the shells having to be pulled out with an iron tool. During the last 50 rounds the hammer followed the breech-block as before.

V. It opened freely and worked as before.

NOVEMBER 22, 1872.

VI. Opened easily and worked throughout as before.

VII. Worked easily throughout. At the third fire the cartridge-head blew off, doing the piece no harm.

NOVEMBER 20, 1872.

Display.—IV.—With brass shells it worked more freely.

V. With brass shells it worked more freely, as before; they were extracted easily, but not ejected.

SPRINGFIELD.

NOVEMBER 21, 1872.

The safety-test was complied with.

I. No. 1. A strong escape of gas to the sides.

No. 2. Escape of gas to the sides.

No. 3. Slight escape of gas to the sides.

II. Seventeen shots, 10 hits.

III. Twenty-two shots, besides one in the chamber not fired.

IV. The test was completed.

V. The gun worked well throughout.

DECEMBER 2, 1872.

VI. After the first cartridge the cam stuck very slightly in opening. The gun worked well throughout.

VII. After the third fire the cam stuck very slightly in opening. Otherwise everything worked well.

WARD-BURTON.

DECEMBER 3, 1872.

The safety-test was complied with.

I. No. 1. Escape above along line of the recoil-block.

No. 2. Same.

No. 3. Slight escape as before.

II. Twenty shots, 13 hits.

III. Twenty-five shots, besides 2 dropped in loading.

IV. The test was completed. During the second 50 rounds one cartridge missed fire and failed to explode under the prick-punch. During the fifth 50 rounds the front guard-screw was broken, showing signs of excessively coarse crystalline structure. It was replaced and the trial gone on with.

V. Worked well throughout.

DECEMBER 6, 1872.

VI. The gun was not very rusty, owing to the solution having been retained in the breech-bolt, and thus keeping the rust from drying hard. The gun worked well throughout the test.

VII. The gun worked freely throughout; at the third fire the shell was blown into the extractor-hole.

DECEMBER 3, 1872.

Display.—Another Ward-Burton musket was fired by an expert, Mr. Strube, with service-ammunition from cartridge-box.

II. Nineteen shots, 18 hits.

III. With Berdan brass ammunition from cartridge-box; 29 shots, besides 1 dropped in loading.

A Ward-Burton carbine furnished with gas-ports, intended to direct the escape from defective cartridges upward, diagonally, to the right and left, was fired.

I. Nos. 1 and 2 showing escape through ports.

No. 3. Slight escape as before.

The fouling also worked back somewhat into the receiver. (See record of incomplete tests, page 89.)

ELLIOT.

DECEMBER 6, 1872.

The safety-test was complied with.

I. Nos. 1 and 2. Strong escape of gas above, and a slight one below. The piece opened hard, but afterwards worked freely.

No. 3. No escape.

II. Eighteen shots, besides one in the chamber not fired; 9 hits.

III. Twenty-six shots.

IV. The gun worked well throughout.

V. The piece worked well throughout.

DECEMBER 9, 1872.

VI. Opened and worked very hard, the breech-block having to be rapped, and the hammer repeatedly worked to and fro to move the other parts.

VII. Worked as above, except that no additional trouble was found due to the excessive charges. At the first fire the cartridge-head cracked. In oiling and working the arm afterwards the trigger-spring was accidentally broken.

FREEMAN.

DECEMBER 5, 1872.

The safety-test was complied with.

- I. No. 1. Escape to the left. Paper was torn.
Nos. 2 and 3. Slight escape to the left.
- II. Fourteen shots, 6 hits.
- III. Sixteen shots.

DECEMBER 6, 1872.

- IV. Before firing, the cam-screw was found loose, and screwed home. Two hundred rounds were fired; one head burst during each of the first three 50 rounds, doing the piece no harm. The arm was then withdrawn to allow the breech-block to be fitted more closely against the head of the cartridge.

DECEMBER 9, 1872.

Replaced after changes made as suggested in journal of December 6. The safety-test was omitted.

- I. Nos. 1 and 2. Strong escape above and to the side. The paper was torn.
No. 3. A slight escape as before.
- II. Fourteen, besides one in chamber not fired; 10 hits.
- III. Eighteen, besides one in chamber not fired, and two dropped.
- IV. The test was completed, the arm working well throughout. During each of the third and fifth 50 rounds one cartridge missed fire, but went at the second trial.
- V. The arm worked well throughout.

DECEMBER 13, 1872.

- V. Worked freely throughout.
- VII. After the third fire, had to be opened with the foot, pulling off the head of the cartridge in doing so. By snapping the hammer after the piece was cleaned, the firing-pin was accidentally broken off at its rear shoulder, showing signs through the oil-stain of the progressive character of the fracture.

ALLIN.

DECEMBER 17, 1872.

The safety-test was complied with.

- I. Nos. 1 and 2. Strong escape to the sides, tearing the paper.
No. 3. Slight escape to the sides.
- II. Sixteen shots, besides one in chamber not fired; 12 hits.
- III. Twenty-three shots.
- IV. The test was completed; every thing worked well.
- V. Everything worked well.

JANUARY 13, 1873.

- VI. Well rusted throughout lock, and in the cam-latch recess; worked easily.
- VII. Worked well. The head of the third cartridge burst, doing no harm.

BERDAN-RUSSIAN.

DECEMBER 17, 1872.

The safety-test was complied with.

- I. Nos. 1 and 2. Very strong escape to sides, tearing the paper.
No. 3. Slight escape to the sides.
- II. Fourteen shots, 13 hits; the breech-bolt closing hard.
- III. Eighteen shots, besides one in chamber not fired.
- IV. The test was completed; 4 shells not being ejected had to be picked out of the receiver with the fingers. During the ninth 50 rounds, one cartridge missed fire, but exploded on second trial. The block closed hard as before, requiring two motions.
- V. The test was completed; everything worked well.

DECEMBER 20, 1872.

- VI. The arm was opened with great difficulty, having to be struck very hard in order to liberate the bolt. Twenty shots were fired, the arm working more freely as the test went on.
- VII. The arm worked as above throughout.

LEE, No. 54.

DECEMBER 19, 1872.

The safety-test was complied with.

- I. No. 1. Strong escape above, tearing the paper.
No. 2. Same, with slight escape below.
No. 3. No escape.
After firing the service-cartridge the piece was opened with so much difficulty that it was impossible to continue the test. Thereupon Mr. Lee obtained permission to complete this and the third test with Martin-cartridges, with these he obtained:
- II. Sixteen shots, 9 hits. Two miss fires, one of which went on the third trial. The other failed three times but was exploded with the prick-punch. The gun worked hard throughout.
- III. Twenty-two shots, and one dropped in loading; one miss-fire went on second trial.
- IV. Using service-cartridges, the test was completed. During the fifth 50 rounds, one cartridge failed three times, but was fired with prick-punch.
- V. After the first exposure the mainspring was found to be broken in two places, and the test was therefore suspended.

JANUARY 13, 1873.

The mainspring broken December 19 having been replaced, the test was completed; everything working well.

JANUARY 16, 1873.

- VI. Breech-block opened freely, though not held effectively by the breech-block catch. At first the breech-block came up with great difficulty, and required a hard blow to open it. The gun

worked more easily as the trial went on, though it was scarcely ever opened by the natural use of the thumb.

VII. Nos 1 and 2. Everything worked well.

No. 3. One failed three times, but exploded under prick-punch. Two fired with difficulty, from the hammer being rust-bound. The cartridge-head burst, doing the piece no harm.

LEE, No. 61.

DECEMBER 19, 1872.

The safety-test was complied with.

I. No. 1. Strong escape above.

No. 2. Slight escape above.

No. 3. Very slight escape above.

II. Fourteen shots, 11 hits.

III. Nineteen shots, besides two dropped and one in chamber not fired.

IV. The test was completed. During the first 50 rounds one cartridge missed fire, but went on second trial.

V. The gun pulled off very hard after the first exposure.

JANUARY 10, 1873.

VI. Opened hard, and worked stiffly throughout.

VII. Opened hard, and worked stiffly throughout.

ROBERTS.

JANUARY 7, 1873.

The safety-test was complied with.

I. Nos. 1 and 2. Very strong escape above, blowing a hole in the paper.

No. 3. Very slight escape above. The piece was worked with difficulty, owing to the fouling of the mechanism by the gas.

II. Seven shots, besides one dropped in loading, and one in chamber not fired. Six hits.

III. Eleven shots, besides two dropped in loading, and one in chamber not fired. This excessive dropping of cartridges was due to the accidental locking of the breech-block after opening from the action of the breech-block spring, which, being unobserved by the firer, caused him to press with such force on the breech-block to open it that the cartridges would slide off and fall to the ground.

IV. At the fifty-first fire the mainspring broke, showing a fine clean fracture, clear from cracks. The gun was then set aside for further action by the Board.

JANUARY 13, 1873.

The mainspring having been replaced by order of the Board, the test was resumed and completed.

V. The test was completed. One cartridge missed fire three times, but exploded under the prick-punch.

JANUARY 16, 1873.

- VI. Opened very hard; could not be locked by cocking the hammer until 17 shots had been fired.
- VII. Worked well throughout.

SPRINGFIELD-STILLMAN.

JANUARY 13, 1873.

The safety-test was complied with.

- I. No. 1. Slight escape above.
No. 2. Escape along line of receiver.
No. 3. No escape.
- II. Nineteen shots, 11 hits.
- III. Twenty-three shots.
- IV. The test was completed, everything working well.
- V. The test was completed, everything working well.

JANUARY 16, 1873.

- VI. Opened and worked easily throughout.
- VII. Worked easily throughout. No. 3 cartridge-head burst, doing the piece no harm.

REMINGTON-RYDER, No. 67.

JANUARY 13, 1873.

The safety-test was complied with.

- I. Nos 1 and 2. Very strong escape above and below, tearing the paper.
No. 3. Very slight escape.
- II. Fifteen shots, 13 hits. The breech opened with the thumb. Ejection interfered with by the shells striking against the thumb.
- III. Twenty-one shots; ejection as before; opened at will.
- IV. The test was completed. One cartridge missed fire, but went on second trial.
- V. Everything worked well.

JANUARY 16, 1873.

- VI. Had to be opened by pounding on the firing-pin to liberate the retractor, and then on the thumb-piece to move the block. Twenty shots were fired without failure, the arm working stiffly throughout. It was discovered afterward that the ejector-spring had broken before the test was begun. Its absence, however, was not perceptible from the working of the piece.
- VII. No. 1. Everthing worked well.
No. 2. The piece opened hard.
No. 3. The cartridge-head burst, doing the piece no harm. The breech was opened with the foot.

WARD-BURTON MAGAZINE-CARBINE.

FEBRUARY 4, 1873.

Ward-Burton magazine-carbine, carrying 8 shots in the magazine, and 1 in the chamber, firing a special recessed copper-cup cartridge, holding 55 grains powder, and 360 grains lead. The safety test was complied with. The following modifications of the required tests were agreed to and carried out, with the specification that throughout, when practicable, the magazine should be held full in reserve:

- I. Firing 10 rounds as a single loader, holding the magazine in reserve. Everything worked well.
- II. Number of shots in one minute, with aim at the usual target and distance, using the arm as a single-loader, and holding the magazine in reserve, 23 shots, 13 hits.
- III. Same at will, 24 shots, besides one dropped in loading.
- IV. Two cartridges caught in the receiver in loading, and interfered with manipulation of the arm. Time required to fire and load 3 magazinefuls, (24 shots,) starting with a full magazine, 1 minute 35 seconds.
- V. Time required to fire 9 shots, starting with a full magazine and chamber, 10½ seconds.
- VI. Time required to fire 9 shots as a single-loader, starting with a full chamber, 17½ seconds. Repeated in 18 seconds.
- VII. Defective cartridges:
Nos. 1 and 2. Strong escape above, along line of receiver.
No. 3. No escape.
- VIII. Endurance. Everything worked well firing the 500 shots, the last eight of which had been in the magazine throughout the test. During the eighth 50 rounds one cartridge missed fire from having no cup or fulminate.
- IX. Dust. 1. The gun was started, working with some difficulty, but afterward fired 20 shots with ease.
2. Everything worked well.

FREEMAN, No. 76.

FEBRUARY 5, 1873.

The safety-test was complied with.

- I. No. 1. Strong escape through left-hand gas-port, blowing a hole in the paper and setting fire to it.
No. 2. Strong escape through both gas-ports, blowing a hole in the paper.
No. 3. No escape.
- II. Sixteen shots, besides one dropped in loading; 6 hits.
- III. Seventeen shots, besides four dropped in loading, from imperfect manipulation, the cartridge occasionally striking the side of the chamber instead of entering it, and sometimes being thrown out by the ejector-spring before the block could be closed. Repeated: 21 shots, besides one dropped in loading.
- IV. Three hundred rounds were fired. The counter-bore of the chamber was so shallow that difficulty in closing the piece was found throughout the test. Three cartridges, in consequence, could not be introduced into the chamber.

FEBRUARY 6, 1873.

The test was completed, the arm working as before. During the seventh 50 rounds one cartridge missed fire three times. It was found to contain an insufficient quantity of fulminate.

V. Worked freely after each exposure.

FEBRUARY 18, 1873.

VI. Opened and worked freely throughout.

VII. Nos. 1 and 2. Worked well.

No. 3. Opened hard; the cartridge-head burst into the extractor-recess.

ELLIOT, No. 80.

FEBRUARY 5, 1873.

The safety-test was complied with.

I. No. 1. Strong escape above.

No. 2. Very strong escape above.

No. 3. No escape.

II. Twenty-one shots, 11 hits.

III. Twenty-five shots.

IV. Three hundred rounds were fired; with the exception of the same trouble found in the Freeman gun, which obtained in this arm in a somewhat less degree, the arm worked well.

FEBRUARY 6, 1873.

The test was completed, the arm working as before.

V. Worked freely after each exposure.

FEBRUARY 18, 1873.

VI. Opened and worked freely throughout.

VII. Nos. 1 and 2. Worked well.

No. 3. Cartridge-head burst into the extractor-recess. Shell was driven out with the ramrod.

BROUGHTON, No. 79.

FEBRUARY 19, 1873.

The safety-test was complied with.

I. Nos. 1 and 2. Violent escape of gas above and to the sides, tearing the paper to pieces.

No. 3. Slight escape of gas.

II. Sixteen shots, besides one dropped in loading. Once the trigger was pulled before the block was fully closed, causing a miss-fire; 9 hits.

III. Twenty shots, besides one in the chamber not fired.

IV. Four hundred rounds were fired. The uncertainty affecting the complete closing of the breech, above noticed, was observed throughout.

FEBRUARY 20, 1873.

The test was completed.

Although due care was taken in closing the block, during the last 50 rounds, two cartridges failed at the first blow of the hammer, but went under the second trial. The faintness of the impression renders it probable that this was due to the striking of the hammer against the block.

V. The test was completed; everything worked well.

WINCHESTER MAGAZINE-MUSKET, No. 78.

FEBRUARY 19, 1873.

Magazine-musket, carrying 10 shots in the magazine, besides 1 in the carrier, if necessary, the charge being 70 grains powder and 360 grains lead.

The safety-test was complied with.

I. Nos. 1 and 2. Very violent escape above, tearing the paper.

No. 3. Escape of gas above.

II. As a single-loader, with aim, holding magazine in reserve. Eleven shots, besides one in chamber not fired. One cartridge failed from having no powder; 7 hits.

III. Rapidity at will, first emptying the magazine and then continuing as a single-loader. Twenty-two shots in one minute.

IV. Rapidity at will, as a single-loader, holding the magazine in reserve. Eighteen shots, besides one in chamber not fired. One cartridge missed, but went under the prick-punch.

Repeated, as a display, by Mr. Bennett, agent; 25 shots. One missed, but could not be found for trial with the prick-punch.

V. The time required to fire three magazinefuls, (30 shots,) starting with a full magazine, 28 fires in 1 minute 9 seconds. In the haste of loading, one cartridge was omitted from each of the last two magazinefuls.

VI. The time required to fire 11 shots from the magazine, 1 cartridge being in the carrier, 10 shots in $18\frac{1}{4}$ seconds.

One cartridge failed to come down, owing to accidental derangement of the cut-off in firing.

Repeated. Eleven shots in $7\frac{1}{2}$ seconds.

VII. Eleven shots as a single-loader, holding full magazine in reserve, fired in $31\frac{1}{2}$ seconds.

VIII. Endurance. Two hundred rounds were fired; everything working well.

FEBRUARY 20, 1873.

The test was completed, keeping the magazine in reserve. It was observed that the stock was split for about 12 inches in front of the guard-strap. The rear end of the lever was so marred as to be closed with difficulty. It was found that, in closing the breech before the lever came fully into place, the safety-latch in rear of the trigger might be accidentally touched, so that the trigger could be pulled and the piece discharged before it was securely locked.

IX. Dust. The arm worked well throughout.

At the conclusion of this test the cartridges which had been retained in the magazine from the beginning were fired. Although the balls were much flattened and upset by the repeated concussion of firing, everything worked well.

I.—REGULAR SERIES OF TESTS—(b) INCOMPLETE.

EVANS.

OCTOBER 10, 1872.

Mr. Evans fired 26 shots in $1\frac{1}{2}$ minutes, using his piece as a single-loader, and firing at will; no miss-fires. He loaded his magazine with 38 cartridges in 1 minute, and then fired the piece as a single-loader, holding his magazine in reserve, and loading through the butt to supply the place of cartridges discharged, 18 times in 1 minute; no miss-fires. He fired the 38 shots from the magazine in 19 seconds; no miss-fires.

A handful of dry, fine sand was sifted over the exposed parts of the breech, which, together with a broken firing-pin, effectually clogged the working of the piece. Mr. Evans claimed the breaking of the firing-pin during the previous trial as due to defective tempering of the metal.

ROBERTS.

OCTOBER 23, 1872.

General Roberts fired 10 rounds as a test of safety, using service-cartridges.

II. R. T. Hare firing 12 shots, 11 hits. Cartridge-shells extracted with extreme difficulty.

III. Fifteen shots, 1 miss-fire, which afterwards fired in Springfield musket, model 1868.

IV. First 50 rounds, 1 miss-fire, which exploded on second fire.

Second 50 rounds, 1 missed twice, but exploded when struck with a prick-punch.

Third 50 rounds, 1 miss-fire, which exploded on second trial.

Fourth 50 rounds, at the sixth fire the stock split off in a piece 6 inches long in the neighborhood of the left recoil shoulder. The stock was also splintered in rear of the tang. The firing with this gun was then suspended.

Display.—Under test III General Roberts fired 17 shots, using Martin improved cartridges; 8 miss-fires, which afterward exploded in a Springfield musket, model 1868.

In his hands the extraction was easily performed.

REMINGTON, No. 23.

OCTOBER 28, 1872.

The safety-test was complied with; everything worked well.

I. No. 1. Slight escape above and on each side.

No. 2. Slight escape above.

No. 3. No escape.

II. Fifteen shots, 14 hits.

III. Eighteen shots.

IV. First 50 rounds, worked very hard after firing; proved to be due to the cartridge by firing a Martin shell. The firing was continued through the four hundredth round without further trouble than that noticed above, and the usual incomplete ejection of the shell. After the test was completed, 15 Remington brass shells were fired and extracted easily.

OCTOBER 30, 1872.

The test was continued without trouble until the three hundred and ninetieth fire, when the hammer had to be worked back and forth several times in order to bring the recoil-brace out of the way of the breech-block. This happened twice afterwards before the completion of the 400 rounds. The system was then examined and the dog-spring found broken, rendering the gun unserviceable.

Display.—Before this test Mr. Bush, using Remington brass ammunition, fired in 1 minute 25 shots at will.

THOMAS.

NOVEMBER 12, 1872.

The safety-test was fired by the agent.

I. Nos. 1 and 2. Escape of gas above.

No. 3. No escape.

NOVEMBER 14, 1872.

On examining the arm before tests I and II, the working of its mechanism was discovered to be so imperfect that its trial was ordered to be discontinued. On handing over the piece to the agent it was claimed by him that the fly had been turned upside down, although it was asserted by the employé in charge of the piece that it had not been taken apart since the endurance-test of yesterday, during which it worked freely. The agent having been allowed to correct the defect, the gun was received anew and tested, being fired by Mr. Lyon, Mr. Hare's hand being disabled from injuries previously received.

II. Twelve shots, besides one in the chamber not fired; 4 hits.

III. Sixteen shots, besides one in the chamber not fired.

NOVEMBER 12, 1872.

IV. Fired 400 rounds. After the seventh 50 rounds the movement of the breech-block was much impeded; the cause of this could not be definitely ascertained, owing to the block having been inconsiderately taken out after gun was cooled and before the assembling of the Board.

NOVEMBER 13, 1872.

The gun worked more easily than when left yesterday. The test was completed.

NOVEMBER 14, 1872.

V. Opened and worked well throughout.

NOVEMBER 18, 1872.

VI. Opened freely; the fly failed to move out of the way of the hammer in falling. The arm was ordered set aside for further examination, by which its action was found impeded with rust, and the impossibility of setting the fly upside down, as claimed by the agent November 14, fully demonstrated.

MORGENSTERN.

Using Russian ammunition brass shell.

NOVEMBER 13, 1872.

The safety-test was complied with.

I. No. 1. The paper was torn to pieces.

No. 2. Very slight escape above.

No. 3. No escape.

IV. After 8 shots the breech-block would not close sufficiently to allow the bolt to slide through it freely, and the gun was set aside.

GREENE.

NOVEMBER 14, 1872.

The safety-test was complied with, using the arm both as a magazine-gun and a single-loader.

I. No. 1. Escape on right side; paper torn.

No. 2. Escape on right side.

No. 3. No escape.

NOVEMBER 15, 1872.

II. Fifteen shots; dropped 2 cartridges through the well in loading; 9 hits.

III. Eighteen shots, besides one in chamber not fired.

NOVEMBER 14, 1872.

IV. Fired 150 rounds.

NOVEMBER 15, 1872.

Completed the test; several shells in extracting turned in the well of the receiver and were gotten out with great difficulty.

V. The gun opened, worked, and pulled off hard throughout.

NOVEMBER 18, 1872.

VI. Opened very hard, having to be kicked open and struck with a stick. The surface of the bolt was found thoroughly rusted. On attempting to fire it it was found that when cocked the firing-bolt could not be released. The arm was then set aside.

ROBERTSON.

Using Spencer cartridges, rim-fire, caliber .52.

NOVEMBER 19, 1872.

The safety-test was fired by Mr. Hare.

II. Thirteen shots, 11 hits. One cartridge missed fire, but exploded on the second trial.

At this point the Board granted Mr. Robertson permission to withdraw his gun for the purpose of altering it so as to fire the United States service-cartridge.

DECEMBER 5, 1872.

The safety-test was complied with.

I. No. 1. Strong escape below and above; the paper was torn.

No. 2. Slight escape below and a strong one above; the paper was torn.

No. 3. No escape.

II. Fourteen shots, 11 hits. In working the lever the firer's hand was badly cut by the back of the trigger.

III. Sixteen shots, and one in chamber not fired. The same trouble obtained with the trigger.

DECEMBER 6, 1872.

IV. Fifteen rounds were fired, when it was discovered that the piece could be fired before the breech was locked. The arm was then withdrawn by Mr. Robertson in order to make the necessary changes.

JANUARY 15, 1873.

The defect found December 6 having been corrected, the trial was resumed at the fourth test. Eighteen rounds were fired, when one head burst into the extractor-recess, the gas issuing with great force into the face of the firer. Mr. Robertson then withdrew the arm for change.

SPENCER.

NOVEMBER 19, 1872.

The safety-test was fired by Mr. Hare.

I. No. 1. Escape of gas above and to the sides; the paper was torn.

No. 2. Escape of gas above, below, and on the sides.

No. 3. No escape.

II. Thirteen shots, besides one in the chamber not fired; 13 hits.

III. Nineteen shots.

IV. Four hundred rounds were fired, the gun working stiffly throughout.

NOVEMBER 20, 1872.

The test was completed.

V. The test was completed, the gun working freely after exposure.

NOVEMBER 22, 1872.

- VI. The arm opened and worked so hard that after firing 7 shots the trial was discontinued, and it was ordered set aside for further action by the Board.

JOSLYN-TOMES.

NOVEMBER 20, 1872.

A few shots were fired, but it worked so hard that further trial was postponed until the arrival of the agent.

NOVEMBER 21, 1872.

The safety-test was fired by Mr. Hare with Martin cartridges, which the Board authorized for the test of this gun in consequence of the sticking of the Frankford shells.

I. Nos. 1 and 2. A strong escape of gas above.

No. 3. No escape.

II. Fourteen shots, 12 hits; 2 miss-fires; went on second trial.

III. Seventeen shots, 4 miss-fires; 3 went on second trial, and 1 on third trial. Its working was so poor and the failures so frequent that it was decided to postpone further trial with the arm.

DECEMBER 3, 1872.

Using Martin cartridges. (See Journal Nov. 21.)

II. Fifteen shots, 6 hits; 3 missed fire, of which 2 went on second trial and 1 on third trial.

III. Twenty shots; 1 missed fire but went on second trial. The extractor failed to withdraw two shells on first trial. The arm opened and extracted hard throughout.

IV. The use of the service-cartridge was here directed by the Board for the ensuing trial. During the first 50 rounds one cartridge missed fire, and failed when tried under the prick-punch. When opened the amount of fulminate was discovered insufficient. During the third 50 rounds one cartridge missed fire, but went on the second trial. During the sixth 50 rounds 5 shells could only be extracted by repeated attempts with the bolt, or by using the ramrod, 1 cartridge-rim being torn through by the extractor. It was therefore—

Resolved, That, in the opinion of the Board, the experiments have shown that the Joslyn-Tomes system would require such radical changes to render it suitable for military service as to make its further consideration by them unnecessary.

The arm was then set aside, to await further action by the full Board.

JANUARY 7, 1873.

This arm, returned by Mr. Joslyn after repairing the extractor which gave out November 21, was fired, beginning at the fourth test, as follows:

IV. During the first and ninth 50 rounds 2 cartridges missed fire, but went on the second trial. During the tenth 50 rounds 1 car-

tridge-head burst, doing the piece no harm. As a rule, throughout the trial, unless the breech-bolt was brought back with great force, the shell would not be ejected from the receiver. The bolt, after firing, sometimes stuck so hard as to require considerable force to open it. Otherwise the piece worked well.

- V. At the eighteenth round the firing-pin was found broken near the point, and the piece laid aside and permission given to replace it.

JANUARY 8, 1873.

After replacing firing-pin, the test, after the first exposure, was completed; everything worked well. 2. Three cartridges missed fire, but went at the second trial, Mr. Joslyn claiming that this was due to neglecting to close the breech with sufficient force; fired 10 shots without failure.

JANUARY 10, 1873.

Worked very hard, having to be forced open with the foot.

- VI. Sixteen shots were fired; 9 missed fire, 6 of which went on second trial; 1 of which went on third trial; and two of which went under prick-punch. The gun had to be opened with the foot four times. It was closed twice with almost as much difficulty. After the sixteenth shot, finding it impossible to close the breech completely, the gun was laid aside. It was afterwards ascertained that the difficulty came from the rust getting under and locking the breech-bolt spring.

JANUARY 14, 1873.

Fired at the special request of Mr. Joslyn.

- VII. Nos. 1 and 2. Everything worked well.

No. 3. The cartridge-head blew into the extractor-recess. The gun was opened with the foot, and worked with difficulty afterwards.

VAN CHOATE.

DECEMBER 2, 1872.

The safety-test was complied with.

- I. Nos. 1 and 2. Escape above and to the sides; the paper was torn to pieces.

No. 3. No escape.

The system was so clogged with gas as to work with great difficulty.

DECEMBER 3, 1872.

- VI. After the first exposure it was found that the hammer would fall from the full-cock, without the trigger being touched. The action of the hammer was so much impeded that it repeatedly failed to explode the first cartridge tried. The arm was then set aside, to await further action by the full Board.

MILBANK, No. 50.

DECEMBER 4, 1872.

The safety-test was complied with.

- I. Nos. 1 and 2. Strong escape above and on the right side.
No. 3. No escape.
- II. Nine shots, besides one in the chamber not fired; 8 hits. As a rule, throughout the tests the shells were only partly withdrawn by the extractor, having to be picked out of the receiver with the fingers. In the excitement of firing the operator's hand was badly pinched by the locking catch.
- III. Fourteen shots.
- IV. One hundred rounds were fired; 1 head burst, doing no harm.

DECEMBER 5, 1872.

Mr. Milbank withdrew his arm, partially tested yesterday, for alteration.

MILBANK, No. 51.

DECEMBER 4, 1872.

The safety-test was complied with. One cartridge-shell was not extracted on the first withdrawing of the bolt.

- I. No. 1. Strong escape above and to the right, tearing the paper.
No. 2. Slight escape above and to the right.
No. 3. No escape.
Mr. Milbank having expressed his fears that in the test for rapidity with the service-cartridge the face of the breech-bolt, not being concave, might strike the fulminate with sufficient force to explode it, he was allowed to substitute for it a brass cartridge with the Milbank recessed primer. It having been discovered that the point of the firing-pin projected beyond the face of the bolt, it was ordered to be filed off.
- II. Two shots; 2 missed, but went on second trial; 9 hits.
- III. Fifteen shots; 4 missed fire; 3 went on second trial; 1 failed under the prick-punch.

DECEMBER 5, 1872.

- IV. One hundred rounds were fired; the ejector often failed to throw out the shells. Two heads burst, doing the piece no harm; their yielding was due to two large cavities in the face of the breech-bolt, into which the copper was blown. The gun was then set aside to await further action by the full Board.

JANUARY 28, 1873.

Returned, having been changed since December 5 by removing the latch on the handle, and by fitting the counter-bore to the service-cartridge.

The test was resumed at the fourth test.

- IV. The test was completed. The empty shells were not always ejected, and the bolt occasionally moved with difficulty.

- V. The arm opened and worked hard throughout. The safety-latch in rear of the guard-bow moved stiffly, and interfered with the ready firing of the piece.

FEBRUARY 1, 1873.

- II. The arm worked better than before.
 VI. Very rusty inside; only opened by continual pounding with a hammer. Worked with the same difficulty during the firing. The sear was rust-bound, so that the bolt would sometimes close without cocking the piece. After firing 15 rounds the test was suspended and the gun laid aside.

STETSON MAGAZINE.

Using special Berdan brass cartridges, 55 grains powder, 300 grains lead.

DECEMBER 4, 1872.

The safety-test was complied with.

- I. No. 1. Strong escape to the right, tearing the paper.
 No. 2. Strong escape to the right; the shell had to be driven out with the rammer.
 No. 3. No escape.
 II. Sixteen shots, besides one in the chamber not fired; 7 hits.
 III. Twenty-four shots, besides one in the chamber not fired.
Display.—By Mr. Stetson. Twenty-six shots; 2 dropped in loading; 1 missed fire, which failed under the prick-punch.

The arm was decided by the Board as being of a model unsuited for the military service, and was consequently set aside for consideration by the full Board. (See Records.)

LEE, No. 53.

DECEMBER 4, 1872.

The safety-test was complied with.

- I. No. 1. Escape above in front.
 No. 2. Strong escape above in front.
 No. 3. No escape; the gun open hard.
 II. Thirteen shots, besides one in chamber not fired; 11 hits.
 III. Sixteen shots; 2 dropped in loading. The extractor worked badly; the arm frequently had to be tipped in order to shake out the empty shell. The contracted front of the mouth of the receiver-well, besides rendering it inconvenient to load, cut the firer's hand on its projecting corners.

DECEMBER 5, 1872.

Display.—By the employé, using Berdan brass cartridges; 18 shots. Mr. Lee withdrew his arm partially tested yesterday.

LEE, No. 54.

Cal. .45. Using brass Berdan-Egyptian ammunition.

DECEMBER 5, 1872.

The safety-test was complied with.

- I. No. 1. A strong escape above directed backwards; paper torn.
- No. 2. A very strong escape above directed backwards; paper torn.
- No. 3. No escape.
- II. Eighteen shots, besides one in the chamber not fired; 10 hits.
- III. Twenty-two, besides one in the chamber not fired.

DECEMBER 6, 1872.

- IV. One hundred rounds were fired, when the test was suspended in consequence of the defective character of the ammunition, Mr. Lee deciding to change his arm to fire the service-cartridge.

EARNEST.

JANUARY 8, 1873.

The safety-test was complied with; the gun opened very hard after almost every shot. This was found due to the projection of the firing-pin, which prevented the swinging of the block. The agent was allowed an opportunity to correct it, and fired three shots more, the gun working as before. He then withdrew the arm to re-enter it Tuesday next.

JANUARY 30, 1873.

The first cartridge tried missed fire twice. The agent then altered the projection of the firing-pin. The second cartridge tried failed as before, the impression from the point of the firing-pin being very faint. It was then discovered that the hammer in falling struck slightly the paper placed to observe the escape of gas. This having been corrected the test was continued as follows:

- I. Nos. 1 and 2. Escape above and in front.
- No. 3. Slight escape above and in front.
- On examining the piece after the test the extractor was found stuck by the fouling so that the breech-block would not readily close. Owing to the severity of the weather the second and third tests were postponed.
- IV. During the first 26 shots 1 cartridge failed five times, but exploded afterwards under the prick-punch; towards the last the block stuck so in opening that the test was suspended, and the arm withdrawn by the agent.

PEABODY.

DECEMBER 18, 1872.

Display.—Mr. Peabody exhibited a gun so arranged as to direct the escape from defective cartridges upwards instead of diagonally backwards, as in the arm previously exhibited. This was tried as follows:

- I. No. 1. Strong escape above along line of receiver, tearing the paper.

No. 2. Same, with a slight escape below.

No. 2. No escape.

A paper was held vertically directly in rear of the receiver.

1. No escape of gas; the cartridge-head was not cut completely through.

Same placed on right side of receiver, leaning slightly over it. Escape of gas along line of receiver.

Display.—By Mr. Wentworth, firing from the shoulder.

II. Twenty-five shots, besides one dropped in loading, and one in chamber not fired.

III. Firing from the hip as usual; 29 shots.

WARD-BURTON.

DECEMBER 18, 1872.

Display.—General Ward exhibited a Ward-Burton musket, with a broken mainspring, which fired successfully 10 shots; he then removed the sear-spring, substituting for it a finger of the left hand. The gun was also fired without a stock or guard, substituting for the sear a wooden pin.

WHITNEY CARBINE, No. 77.

FEBRUARY 5, 1873.

Display.—As a display-test 50 rounds were fired, As a rule the cartridge-shells extracted hard. The corners of the breech-block were so sharp as to cut the hand in working it. The arm was withdrawn for change in this respect.

MERRILL, No. 83.

FEBRUARY 28, 1873.

The safety-test was complied with.

I. Nos. 1 and 2. Escape of gas above.

No. 3. Slight escape above. The first cartridge tried under the second test missed fire three times, but afterwards went under the pick-punch.

II. Thirteen shots, 9 hits; the gun opening very hard after each shot.

III. Ten shots; the gun opening with greater difficulty than before. The piece was then withdrawn for alteration.

GARDNER MAGAZINE, No. 87.

APRIL 7, 1873.

I. The number of shots fired in one minute, using the gun as a single-loader, the magazine being full and cut off. The test was suspended from the imperfect working of the magazine stop-spring.

- II. Using the gun as a single-loader, from the shoulder, in 1 minute 16 shots were fired.
- III. Starting with magazine loaded and one charge in chamber, 9 shots in $8\frac{1}{2}$ seconds.
- IV. Time to fire 3 magazines of 9 shots each, starting with the magazine full, including the time required to load the magazine twice, 27 shots in 1 minute 3 seconds; the first 9 in 6 seconds; the stop-spring failed once to stop the cartridge from flying back in loading.
- V. Three shots, 2 from magazine and 1 in chamber, were fired in 1 second.

II.—SUPPLEMENTARY SERIES.

The supplementary tests were applied to the following arms, in accordance with the resolution of January 30, 1873 :

PEABODY, No. 63.

FEBRUARY 21, 1873.

- I. After each exposure it opened and worked easily.

FEBRUARY 26, 1873.

- II. Opened and worked well throughout.

FEBRUARY 27, 1873.

- III. The arm was in working order.

WHITNEY CARBINE, No. 77.

FEBRUARY 21, 1873.

- I. After first exposure it was opened and worked well. After second exposure it was opened and worked with difficulty. After firing it it could only be opened by striking it with a stick. After the trial was completed it was casually noticed, in preparing the gun for the rust-test, that the breech could not be opened without taking the gun apart.

FEBRUARY 26, 1873.

- II. Had to be opened with the foot; the arm was then fired 5 shots. After three unsuccessful attempts to fire the first excessive charge

the gun was oiled. After firing it was opened with a mallet. The second excessive charge blew the breech open about half an inch, after which it was observed that if in closing the breech the trigger was accidentally touched the hammer would follow up the block and fall upon the firing-pin.

FEBRUARY 27, 1873.

III. The arm was in working order.

SPRINGFIELD-STILLMAN, No. 66.

FEBRUARY 21, 1873.

I. After each exposure it opened and worked easily.

FEBRUARY 26, 1873.

II. Opened and worked well throughout. The heads of both shells used in the excessive charges blew off, causing the block to open rather hard after the second one had been fired.

FEBRUARY 27, 1873.

III. The arm was in working order.

ELLIOT CARBINE, No. 80.

FEBRUARY 19, 1873.

I. After the first exposure worked hard, but without unusual aid. After second exposure worked well, except that some trouble was found in making the hammer stand at the full-cock; supposed to be due to the dust having packed in between the back of the hammer and the frame, or between the barrel and the face of the breech-block.

FEBRUARY 26, 1873.

II. Opened and worked easily during the firing of the 5 rounds, and after the test with excessive charges.

FEBRUARY 27, 1873.

III. The arm was in working order.

WARD-BURTON MAGAZINE-CARBINE, No. 58.

FEBRUARY 20, 1873.

I. It was first exposed with an empty magazine. Two of the shots
9 ORD

afterward fired were loaded from the outside, and 2 taken from the magazine. Everything worked well. After the second exposure the arm opened easily; the first 4 cartridges fired stuck from dust in the chamber, which could be seen but not removed, so that they had to be driven out with a rod. Several shots were immediately afterwards fired and extracted without difficulty. In casually trying the arm afterwards it was found so blocked by the dust that it could not be completely closed; on being taken apart this was found due to the stopping of the ejector-pin by the dust and gas.

FEBRUARY 26, 1873.

- II. The principal parts of the mechanism opened and worked easily, but the follower was rusted in the magazine-tube, so that after various unsuccessful attempts on the part of the employé in charge to move it by natural means and by pressure with an ordinary ramrod, it was turned over to Mr. Keene, the agent of the gun. By spitting on it and rapping it with a hammer and rod he succeeded in starting the follower so that it could be pushed out of the way of the five cartridges with which the magazine was charged. In firing these the descent of the carrier, and hence the closing of the breech, was interfered with by the failure of the spring-hook at the mouth of the magazine to prevent the succeeding cartridges from protruding under the carrier. In each of the tests with excessive charges the cartridge-heads blew into the extractor-hole; in consequence the piece opened hard after the first charge had been fired. It was opened easily after firing the second charge.

FEBRUARY 27, 1873.

- III. The arm was in working order.

UPDEGRAFF, No. 42.

FEBRUARY 20, 1873.

- I. The second defective cartridge fired failed three times, but was fired by letting down the hammer on the firing-pin and striking it a blow with a stick. After dusting, it was opened after working at it for about ten minutes, but it would not move automatically as intended. After working at it for about twenty minutes a cartridge was inserted and fired after four attempts, the hammer striking on the half-cock notch in falling. Three more cartridges were fired with difficulty. After the second exposure it was tried to fire two defective cartridges in the manner above mentioned, but without success.

FEBRUARY 26, 1873.

- I. In one the fulminate exploded without setting fire to the powder, the other went under the prick-punch.
 II. Had to be opened with a hammer, a liberal application of oil having no beneficial effect after repeated working of the parts.
 The piece was then dropped.

SHARPS, No. 5.

FEBRUARY 21, 1873.

- I. After each exposure it opened and worked easily.

FEBRUARY 26, 1873.

- II. It worked so hard that it had to be opened by blows with a hammer upon the block. Three shots out of the five missed fire, once owing to the accumulation of rust on the firing-pin. The extractor also worked hard. Before firing the excessive charges the mechanism was oiled. In firing the high charges everything worked well.

FEBRUARY 27, 1873.

- III. The arm was in working order.
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SPRINGFIELD, No. 69.

FEBRUARY 21, 1873.

- I. After each exposure it opened and worked easily.

FEBRUARY 26, 1873.

- II. Opened and worked well throughout. The head of the cartridge-shell blew off in firing the second of the excessive charges.

FEBRUARY 27, 1873.

- III. The arm was in working order.
-

REMINGTON-RYDER, No. 67.

FEBRUARY 21, 1873.

- I. After the first exposure it opened and worked easily. After second exposure it was opened by working at it for about four minutes, but in closing the block the hammer would follow it up and fall on the firing-pin. Even then it could not be invariably opened, the locking-brace sear often failing to catch and withdraw the brace. It was also noticed that, in the event of a cartridge missing fire, the hammer could not be again snapped without withdrawing the cartridge and reloading it. One shot was fired by withholding the hammer with the thumb during the locking of the piece and then letting it go. The gun was then set aside.

FEBRUARY 26, 1873.

- II. Force had to be applied with the foot in order to open the piece. It invariably occurred that in closing the block the hammer would follow up and fall upon the firing-pin. This was in a measure corrected by partly dismounting the mechanism, and the application of a little oil to the neighborhood of the sear-fly; but even with

this aid the sear would not always automatically sustain the hammer at the full cock. Oil was then poured into the mechanism through the trigger-slot in the guard-strap, without any perceptible remedial effect until the piece had been standing for about five hours, when it was tried and found to work quite freely.

FEBRUARY 27, 1873.

- III. Was opened with difficulty by pounding with a hammer on the point of the firing-pin, so as to allow the retractor to move. The arm was therefore dropped.

RUSSIAN-BERDAN, No. 57.

FEBRUARY 20, 1873.

- I. The gun opened and worked very hard after each exposure, although not requiring any unusual aid. The shells in every case had to be driven out with a rod.

FEBRUARY 26, 1873.

- II. It had to be opened with a hammer before firing and after every shot. The excessive charges did not affect it, except as to the difficulty in opening, which continued, although the piece had been oiled.

FEBRUARY 27, 1873.

- III. The arm was in working order.

FREEMAN, No. 76.

FEBRUARY 20, 1873.

- I. After first exposure the gun opened and worked hard. It worked more freely after second exposure.

FEBRUARY 26, 1873.

- II. Owing to the rusting forward of the firing-pin, and its indentation in the cork placed in the chamber to prevent the entrance of the oxidizing solution, the block could only be opened by the aid of a hammer. After firing the last of the five shots, the block was closed with difficulty, owing to the obstruction caused by the point of the extractor, which was stuck by the rust. The piece was oiled after three unsuccessful attempts had been made to fire the first charge. After firing it was opened with the foot, and after the second charge it required the aid of the hammer.

FEBRUARY 27, 1873.

- III. The arm was in working order.

DEXTER, No. 38.

FEBRUARY 19, 1873.

- I. After the first exposure it was opened with great difficulty after working at it for about five minutes, the hammer being snapped and the lever sharply rapped in order to free the piece of dust. After firing six shots, the same trouble, in a less degree, was found. After the second exposure the sear was interfered with by the dust, so as to prevent the fall of the hammer until several attempts to pull it off had been made.

FEBRUARY 26, 1873.

- II. Had to be opened with the hammer. After firing five shots it had to be oiled in order to fire the excessive charges, the first of which opened the front joint of the side-plate about $\frac{2}{100}$ inch, and blew off the cartridge-head. The second also blew off the cartridge-head and separated the joint still more.

FEBRUARY 27, 1873.

- III. The arm was in working order.

LEE, No. 61.

FEBRUARY 21, 1873.

- I. After first exposure one cartridge snapped twice before firing. After second exposure everything worked well.

FEBRUARY 26, 1873.

- II. It opened and worked well until tried with the first of the excessive charges, the effect of which, besides blowing off the cartridge-head, was to throw down the block about half an inch, breaking both branches of its lever-arm and the horizontal arm of the extractor. The arm was then dropped.

ROBERTS, No. 2.

FEBRUARY 20, 1873.

- I. After the first exposure opened easily, but could not be latched by cocking the hammer, and after the second and third shots only by using the foot. After the second exposure the arm could not be made to close either when loaded or empty. It was then set aside.

FEBRUARY 26, 1873.

- II. Worked stiffly at first, but otherwise worked well throughout.
III. The arm was in working-order.

REMINGTON LOCKING-RIFLE, No. 82.

FEBRUARY 21, 1873.

- I. After each exposure it opened and worked well.

FEBRUARY 26, 1873.

- II. Force had to be applied with the foot in order to open the piece; the mechanism at first moved imperfectly, but after working the hammer to and fro it performed its functions more satisfactorily. Five shots were fired without trouble. The piece had to be opened with the foot after each of the excessive charges.

FEBRUARY 27, 1873.

- III. The arm was in working order.

WINCHESTER, No. 78.

FEBRUARY 28, 1873.

- I. After the first exposure the utmost exertion in working the lever and other parts failed to clear the piece of dust sufficiently for movements of the carrier.
The arm was then dropped.

BROUGHTON, No. 79.

FEBRUARY 21, 1873.

- I. After first exposure opened hard, though without great difficulty; the first cartridge was snapped four times, and the other three, twice each before firing. The gun opened hard after the first defective cartridge. After second exposure it opened as before; the second cartridge was snapped twice to fire it.

FEBRUARY 26, 1873.

- II. Opened easily. The jar of closing the block will occasionally cause the hammer to fall. The firing-pin was stuck so fast with the rust that it would not latch the block in closing; its point projected after each discharge, and was with difficulty pried back into a safe position for loading. The fourth cartridge missed fire once; the others were fired without difficulty. After each of the excessive charges the gun had to be opened by striking the latch with a hammer.

FEBRUARY 27, 1873.

- III. Opened hard. The point of the firing-pin projected, and could only be started by dismounting the block and driving it back with a hammer. As the fixed protrusion of the firing-pin rendered possible an explosion of the cartridge before the breech was locked, the arm was dropped.

SHARPS', No. 81.

A new arm not yet tried, selected by the Board as presumably the best representative of the system.

FEBRUARY 19, 1873.

- I. After first exposure opened very hard, and also after the second two defective cartridges had been fired. After second exposure the gun opened very hard; the difficulty was so much increased by firing the first cartridge that on applying force to the lever with the foot it was broken off about $2\frac{1}{2}$ inches from the end. On examination by an expert this was declared due to overheating of the metal in manufacture. The arm was then laid aside. The cartridge-shell was easily removed from the chamber by tapping on the projection of the extractor, showing that the resistance was not due to the sticking of the shell.

REMINGTON NAVY-RIFLE, No. 85.

FEBRUARY 28, 1873.

- I. After the first exposure the piece worked well. After the second exposure the friction-lever failed to keep the block closed, so that it would fall backward and catch the hammer in falling. The extraction was very imperfect, requiring all the force of the firer to withdraw the shell.

MARCH 4, 1873.

- II. Opened and worked stiffly. The firing-pin was rusted forward, and had to be pressed back with a nail. The two excessive charges were fired, everything working well.

MARTINI.

FEBRUARY 28, 1873.

Owing to scarcity of ammunition the piece was fouled by flashing a pinch of powder in the mechanism.

- I. After the first exposure the arm worked stiffly. It pulled off very hard; the extraction was imperfect, the shell being pulled out with great difficulty with the fingers after the extractor had just started it out of the chamber. The piece would not remain open after the lever was depressed. After being again fouled as before it was exposed a second time to the dust, after which it opened very stiffly. One shot was fired, but in trying it afterwards it was found that the tumbler would follow up the motion of the block in closing.

By much working of the parts they performed their functions more properly, though moving stiffly meanwhile.

MARCH 4, 1873.

- II. Opened and worked very stiffly, the tumbler invariably following the movement of the lever in closing. The piece was then dropped as disabled by the rust.

WERNDL.

FEBRUARY 28, 1873.

Fouled as before by flashing powder in the receiver.

- I. After the first exposure the piece opened easily. Three shots were then fired, but extracted with great difficulty by pounding on the handle with a hammer. After the second exposure the gun was disabled, the handle of the block having to be pounded with a hammer in order to move it either way. The gun was then dropped.

III.—FINAL SERIES.

With muskets using the new cartridge, cal. .45.

Trials for rapidity, made in accordance with the following resolution adopted April 8, 1873 :

That the comparative rapidity of fire of each gun shall be determined by taking the average time of five successive trials, which shall be made by the same individual, at intervals of twenty minutes, and which shall consist of firing, with aim, from service-cartridge box No. 2, suspended from the waist-belt, 24 cartridges, of cal. .45.

The guns to be tested at the rate of one each working-day, and in the following order, determined by lot, viz:

No. 1, Elliot; No. 2, Peabody; No. 3, Springfield; No. 4, Remington; No. 5, Freeman; and the alteration of the Ward-Burton magazine-gun when completed.

Prior to the adoption of the foregoing, the following preliminary tests were made, firing with aim, and taking the cartridges from the table :

PRELIMINARY TESTS.—APRIL 4, 1873.

ELLIOT, No. 80.

Ten cartridges were fired, when one cartridge jammed the block so that it could not be closed, nor could it be easily opened for the removal of the cartridge and its replacement by another. On a second trial two shots were fired, when the same trouble was discovered, which again arose on a further test.

REMINGTON, No. 86.

Trouble was found in firing, from the incomplete closing of the block, the hammer striking against it in its fall. This was due to variation in the cartridge-heads, preventing the complete closing of the block.

REMINGTON, No. 85.

Twenty-one shots in 1 minute; 2 cartridges missed fire; 1 went on second trial, and 1 on third trial.

FREEMAN, No. 76.

Eighteen shots in 1 minute. Block stuck hard in closing once.

SPRINGFIELD, No. 88.

Nineteen shots in 1 minute.

PEABODY, No. 63.

Nineteen shots in 1 minute.

TESTS FOR RAPIDITY.**ELLIOT, No. 80.**

APRIL 9, 1873.

First trial: 24 shots in 1 minute $24\frac{1}{2}$ seconds; 2 shells failed to eject.
Second trial: 24 shots in 1 minute 25 seconds; 2 shells failed to eject.
Third trial: 24 shots in 1 minute 16 seconds; 2 shells failed to eject.
Fourth trial: 24 shots in 1 minute 24 seconds; 2 shells failed to eject.
Fifth trial: 24 shots in 1 minute 14 seconds; 1 shell failed to eject.
Average, 1 minute $21\frac{1}{2}$ seconds.
At the rate of 17.7 shots per minute.

SPRINGFIELD, No. 88.

APRIL 10, 1873.

First trial: 24 shots in 1 minute $32\frac{1}{2}$ seconds.
Second trial: 24 shots in 1 minute 33 seconds.
Third trial: 24 shots in 1 minute 38 seconds.
Fourth trial: 24 shots in 1 minute 30 seconds.
Fifth trial: 24 shots in 1 minute 29 seconds; 1 cartridge missed fire twice.
Average, 1 minute 32.5 seconds.
At the rate of 15.65 shots per minute.

SPRINGFIELD, No. 88.

With new mainspring.

APRIL 16, 1873.

First trial: 24 shots in 1 minute 28 seconds; 1 cartridge missed fire once.
Second trial: 24 shots in 1 minute $28\frac{1}{2}$ seconds.
Third trial: 24 shots in 1 minute $28\frac{1}{2}$ seconds.

Fourth trial: 24 shots in 1 minute $23\frac{1}{2}$ seconds.

Fifth trial: 24 shots in 1 minute $23\frac{1}{2}$ seconds.

Average, 1 minute 25.6 seconds.

At the rate of 16.82 shots per minute.

REMINGTON, No. 86.

APRIL 14, 1873.

First trial: 24 shots in 1 minute 22 seconds.

Second trial: 24 shots in 1 minute 11 seconds.

Third trial: 24 shots in 1 minute 11 seconds; 1 cartridge dropped in loading.

Fourth trial: 24 shots in 1 minute 11 seconds.

Fifth trial: 24 shots in 1 minute 9 seconds.

Average, 1 minute 12.8 seconds.

At the rate of 19.78 shots per minute.

FREEMAN, No. 76.

APRIL 15, 1873.

First trial: 24 shots in 1 minute 27 seconds; 1 cartridge missed fire once, 1 was thrown back by the force of the ejector-spring in loading, and consequently dropped on the floor.

Second trial: 24 shots in 1 minute 47 seconds; 3 cartridges were thrown back as before and dropped.

Third trial: 24 shots in 1 minute 30 seconds; 1 cartridge failed to be ejected; 2 stuck hard in opening.

Fourth trial: 24 shots in 1 minute 29 seconds.

Fifth trial: 24 shots in 1 minute 22 seconds.

Average, 1 minute 29.8 seconds.

At the rate of 16.03 shots per minute.

PEABODY, No. 63.

APRIL 21, 1873.

First trial: 24 shots in 1 minute 22 seconds.

Second trial: 24 shots in 1 minute 19 seconds.

Third trial: 24 shots in 1 minute 15 seconds.

Fourth trial: 24 shots in 1 minute 14 seconds.

Fifth trial: 24 shots in 1 minute 17 seconds.

Average, 1 minute 17.4 seconds.

At the rate of 18.6 shots per minute.

WARD-BURTON MAGAZINE-MUSKET, No. 97.

APRIL 22, 1873.

The Ward-Burton magazine-musket as a single loader. In working this arm before the actual test was begun, the thumb-piece of the slide-stop or cut-off was broken off, so that the arm could not be tried with the magazine charged and in reserve.

First trial: 24 shots in 1 minute 12 seconds.

Second trial: 24 shots in 1 minute.

Third trial: 24 shots in 1 minute 3 seconds.

Fourth trial: 24 shots in 57 seconds; 1 miss-fire, from an insufficient quantity of fulminate.

Fifth trial : 24 shots in 1 minute 2 seconds ; 2 miss-fires.
Average, 1 minute 2.8 seconds.
At the rate of 22.92 shots per minute.

APRIL 23, 1873.

Time required to fire three magazinefuls, starting with 7 cartridges in the magazine and 1 in the chamber, including the time required to charge the magazine twice, the cartridges being placed in rows of 7 each in a block lying on the table, 22 shots in 63 seconds. The first two magazines were emptied in 12 seconds.

In the first round, from the excessive rapidity of the motion, one cartridge jammed in entering the chamber, and was thrown out without being fired. In each of the last 2 rounds 1 cartridge missed fire, the quantity of fulminate being insufficient to ignite the charge. One round of 8 shots was fired in $9\frac{1}{2}$ seconds ; 1 cartridge jamming as before. This test was consequently repeated, giving the same result, 8 shots in $9\frac{1}{2}$ seconds.

Lieut. METCALFE'S DETACHABLE MAGAZINE.

Time required to fire 10 shots, caliber .45, from Lieutenant Metcalfe's detachable magazine, fixed upon the gun and open, 33 seconds : At the rate of 18.5 shots per minute.

ELLIOT'S MAGAZINE CARTRIDGE-BOX.

Time required to fire 24 shots from Dr. Elliot's magazine cartridge-box, caliber .45, using the Springfield arm, 1 minute 32 seconds ; the first 10 shots being fired in 40 seconds. The same test was started, using the Elliot arm, but was suspended from a failure in extraction, requiring the use of the rammer to drive out the empty shell. Using the Remington arm, 24 shots were fired in 1 minute 37 seconds. When about half emptied, the weight of the remaining cartridges, overcoming the resistance of the pawl, would cause the block to revolve backwards and carry them out of reach.

RAPIDITY OF FIRE BY ENLISTED MEN.

APRIL 24, 1873.

The men having been familiarized by the expenditure of three cartridges, the regular firing was conducted by each man in turn, firing from each of the guns 12 shots, taken from the cartridge-box used in the preceding experiments. The firers had an opportunity to rest between the trials, during the use of the same gun, or of the succeeding one, by their comrades. The trial in one party with each gun was completed before the next one was taken up, giving the gun a chance to cool before it was fired again.

The imperfect ejection of the Elliot gun caused it to be dropped soon after the firing had begun.

Time to fire the following guns, rounds of 12 shots each.

Man's name.	Freeman.	Peabody.	Remington.	Springfield.	Ward-Burton.	Aggregate.	Average.
	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>
Old soldiers. { Dumont	0 47	1 18	0 57	(1d) 1 0	0 51	4 53	0 53 ³ / ₅
{ Parker	(1d) 54	1 3	52	55	1 0	4 44	56 ⁴ / ₅
{ Taylor	1 0 ¹ / ₂	1 1	1 2	1 6	(1d) 56	5 5 ¹ / ₂	1 1 ¹ / ₁₀
{ Hammon	1 2 ¹ / ₂	1 28 ¹ / ₂	49	(1d) 1 7	47	5 14	1 2 ⁴ / ₅
{ Temple	1 7	1 11 ¹ / ₂	56 ¹ / ₂	1 2 ¹ / ₂	* 1 23	5 40 ¹ / ₂	1 8 ¹ / ₁₀
Aggregate	4 51	6 2	4 36 ¹ / ₂	5 10 ¹ / ₂	4 57	25 37	.....
Average	58 ¹ / ₅	1 12 ² / ₅	55 ³ / ₁₀	1 2 ¹ / ₁₀	0 59 ² / ₅	.....	.....
Shots per minute.....	12.37	9.94	13.02	11.59	12.12	.....	.....
Order in rapidity.....	2	5	1	4	3	.....	.....
	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>	<i>m. s.</i>
Recruits. { Anderson	1 13	1 8	1 2	1 15	1 10	5 48	1 9 ³ / ₅
{ August	1 7	1 20	1 20	1 26	51	6 4	1 12 ³ / ₅
{ Flannagan	1 28	1 40	1 11	1 47	1 3	7 9	1 25 ² / ₅
{ Brady	1 16	1 16	59	1 11	1 1	5 43	1 8 ⁴ / ₅
{ Thies	1 5	1 38	1 25	1 24	1 10	6 42	1 20 ⁴ / ₅
Aggregate	6 9	7 2	5 57	7 3	5 15	31 26	.....
Average	1 13 ⁴ / ₅	1 24 ² / ₅	1 11 ² / ₅	1 24 ³ / ₅	1 3	.....	.....
Shots per minute.....	9.75	8.53	10.08	8.51	11.43	.....	.....
Order in rapidity.....	3	4	2	5	1	.....	.....

* Two misfires, which exploded on second trial.

NOTE.—(1 d) signifies that one cartridge was dropped in loading.

SPRINGFIELD, No. 99.

APRIL 29, 1873.

First trial: 24 shots in 1 minute 20 seconds.

Second trial: 24 shots in 1 minute 10.5 seconds.

Third trial: 24 shots in 1 minute 7 seconds.

Average, 1 minute 12.5 seconds.

At the rate of 19.86 shots per minute.

ELLIOT, No. 80.

MAY 3, 1873.

Private Henck, orderly to the Board, fired 24 shots in 1 minute 57 seconds: at the rate of 12.3 shots per minute.

Repeated as before, 24 shots in 1 minute 43 seconds: at the rate of 14 shots per minute.

SPRINGFIELD, No. 99.

MAY 3, 1873.

Private Henck fired 24 shots in 1 minute 32 seconds: at the rate of 15 6 shots per minute.

Lieut. METCALFE'S DETACHABLE MAGAZINE

MAY 3, 1873.

With Lieutenant Metcalfe's detachable magazine tied on the gun, R. T. Hare fired 10 shots in 25 seconds: at the rate of 24 per minute.

Repeated, 9 shots in 23 seconds: at the rate of 23.5 per minute.

From .50 cal. cartridge-box fired 10 shots in 28 seconds: at the rate of 21.4 per minute.

ELLIOT, No. 80.

MAY 3, 1873.

Time required to fire 12 rounds, by the following party of old soldiers, from the Elliot gun No. 80:

1. Dumont, 1 minute 5 seconds.
2. Taylor, 1 minute 20 seconds; 1 dropped and 1 stuck in extracting.
3. Parker, 58 seconds.
4. Hammer, 1 minute 10 seconds.
5. Gamble, 1 minute 4 seconds.

Average, 1 minute $7\frac{2}{5}$ seconds: at the rate of 10.6 per minute.

Time required to fire 12 rounds, by the following party of recruits, from the Elliot gun No. 80:

1. Dike, 1 minute 5 seconds.
2. Hosmer, 1 minute 35 seconds.
3. Turney, 58 seconds.
4. Wilson, 1 minute.
5. Quill, 1 minute 27 seconds.

Average, 1 minute 13 seconds: at the rate of 9.8 per minute.

SPRINGFIELD, No. 99.

MAY 3, 1873.

Time required to fire 12 rounds, by the following party of new soldiers, from the Springfield No. 99:

1. Dike, 1 minute 15 seconds.
2. Hosmer, 1 minute 27 seconds.
3. Turney, 1 minute 22 seconds; 1 dropped.
4. Wilson, 1 minute 5 seconds.
5. Quill, 1 minute 45 seconds.

Average, 1 minute $28\frac{4}{5}$ seconds: at the rate of 8.6 per minute.

INDEX TO SYNOPSIS OF EXPERIMENTAL TESTS.

NOTE.—Some of the arms at first received were not referred to by their docket numbers, since they were then supposed to be the only ones of their name. When other arms of the same origin were afterward received, they were distinguished by reference to their numbers on the docket, *e. g.*, "Springfield," p. 71, and "Springfield, No. 69," p. 93, &c.

Arms.	Regular tests.		Supplementary tests.	Final tests.
	Complete.	Incomplete.		
	<i>Page.</i>	<i>Page.</i>	<i>Page.</i>	<i>Page.</i>
Broughton, No. 18	67			
Broughton, No. 45	67			
Broughton, No. 79	78		96	102, 103
Berdan-Russian, No. 57	74		94	
Dexter, No. 38	62		95	
Earnest, No. 65		88		
Elliot, No. 24	72			
Elliot, No. 80	78		91	98, 99, 102, 103
Elliot's magazine-cartridge box				101
Evans, No. 4		80		
Freeman, No. 59	73			
Freeman, No. 76	77		94	100
Gardner magazine, No. 87		89		
Greene, No. 14		82		
Joslyn-Tomes, No. 40		84		
Lee, No. 53		87		
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Merrill, No. 83		89		
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Milbank, No. 51		86		
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Arms.	Regular tests.		Supplementary tests.	Final tests.
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Remington, No. 19	62			
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Remington, No. 21	63			
Remington, No. 22	64			
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Remington-Ryder, No. 67	76		93	
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Remington navy-rifle, No. 85			97	99
Remington, No. 86				98, 100
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Sharps, No. 81			97	
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Springfield-Allin, No. 68	73			
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Updegraff, No. 42	69		92	
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Whitney, No. 11	70			
Whitney, No. 13	70			
Whitney, No. 77		89	90	

III.

ABSTRACT OF MONTHLY REPORTS FROM THE ARMY

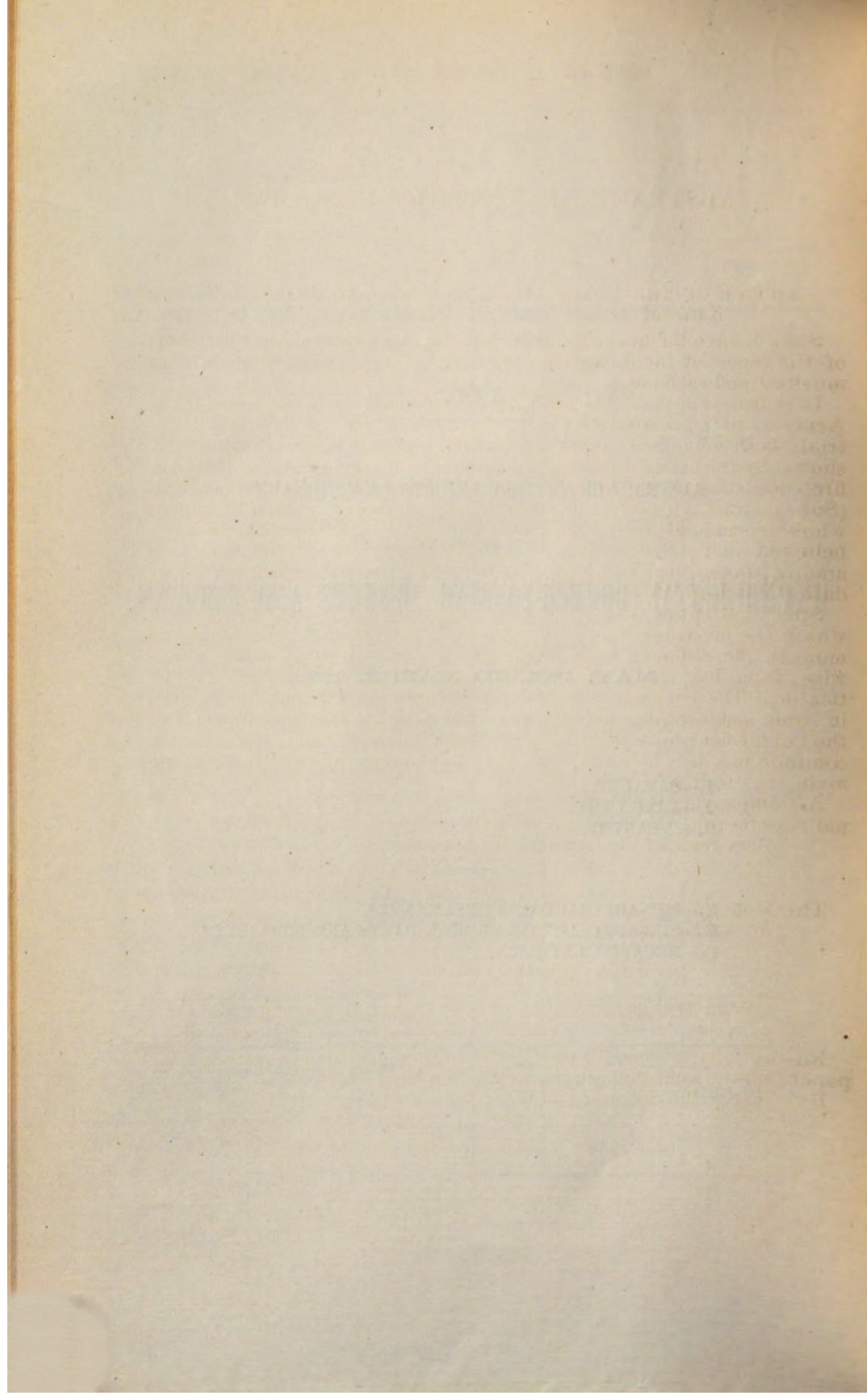
ON THE

EXPERIMENTAL BREECH-LOADING MUSKETS AND CARBINES.

MAY, 1871, TO MARCH, 1873.

- 1.—CAVALRY.
 - 2.—ARTILLERY.
 - 3.—INFANTRY.
-

- A.—SUB-ABSTRACT OF PREFERENCES.
 - B.—SUB-ABSTRACT OF BROKEN PARTS AND MISS-FIRES.
 - C.—RECAPITULATION.
-



ABSTRACT OF MONTHLY REPORTS.

OFFICE OF THE BOARD ON BREECH-LOADING SMALL-ARMS,
National Armory, Springfield, Massachusetts, May 18, 1873.

SIR: I have the honor to forward to-day, by express, Addendum III of the report of the Board for selecting a breech-loading system for muskets and carbines.

It is believed that this will give in a concise form the sense of the Army as to the comparative merits of the weapons in their hands for trial, both voluntarily expressed by their preferences, and involuntarily shown by the collated mass of the accidents of service, and of the miss-fires occurring in the different kinds of arms. From the former class (Sub-abstract A) have been excluded expressions of opinion by officers whose commands were armed with but one kind of weapon, as it was believed that their reports, though interesting, were not comprised among those called for by the circular letter from the Ordnance Office dated March 10, 1871.

Special attention is invited to the recapitulation, (Sub-abstract C) in which the preceding information has been reduced to a standard common to the different arms, a comparison between which would otherwise, from their varied numbers and times of service, have been impracticable. The irregular and defective rendering of the monthly reports, in some instances, has doubtless affected more or less the accuracy of the conclusions to be derived from them, but still, this error being a common one, it is believed that the comparisons indicated are in the main trustworthy.

Accompanying the abstract, in a separate box, will be found the original reports from the field from which this information was obtained.

Very respectfully, your obedient servant,

HENRY METCALFE,
Second Lieutenant Ordnance, Recorder.

The Hon. the SECRETARY OF WAR,
(Through the Adjutant-General U. S. A.) Washington, D. C.

[First indorsement.]

WAR DEPARTMENT, ADJUTANT-GENERAL'S OFFICE,
Washington, May 20, 1873.

Respectfully referred to the Chief of Ordnance, in connection with papers on the same subject transmitted on the 17th instant.

By order of the Secretary of War:

E. D. TOWNSEND,
Adjutant-General.

The succeeding information was compiled from the answers made to the following questions, in accordance with the circular dated Ordnance Office, March 10, 1871, by officers having issued to them for trial the different models of experimental arms, viz:

1. Number, kind, and caliber of arms in company.
2. Number of each kind rendered unserviceable, (included in question No. 3.)
3. Number and names of parts of each of the above kinds which have broken or become unserviceable during the month.
4. What modifications or improvements do you suggest for each arm?
5. Number and kinds of musket-cartridges fired from each kind of arm, and number of failures in each arm.
6. Which of the four systems of breech arrangement would you prefer for uniform use in the rifle muskets and carbines of the military service?

1.—ABSTRACT OF THE MONTHLY REPORTS RECEIVED FROM THE CAVALRY.

Company A, First Cavalry, Captain Thomas McGregor commanding; Remington, Springfield, and Sharps carbines issued July 1, 1871; Ward-Burton carbines issued August 9, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Sept . . .	Remington, at full-cock . . .	29	1 rear-sight . . .	Should load at half-cock . . .	400	7	} Sharps . . .	{
	Springfield . . .	25	None reported . . .	No remark . . .	300	8		
	Sharps . . .	25	1 ejector-spring . . .	do . . .	300	5		
Oct . . .	Remington, at full-cock . . .	29	None reported . . .	Should load at half-cock . . .	150	5	} Sharps . . .	{
	Springfield . . .	25	do . . .	No remarks . . .	100	3		
	Sharps . . .	25	do . . .	do . . .	100	1		
Nov . . .	Remington, at full-cock . . .	29	1 mainspring, 1 trigger-spring, 1 lever-spring . . .	Should load at half-cock . . .	150	3	} Springfield . . .	{
	Springfield . . .	25	1 ejector-spring, 1 cam-latch spring, 1 mainspring, 1 tumblor-screw . . .	No remarks . . .	100	1		
	Sharps . . .	25	1 lever-spring, 2 tumbler-screws . . .	do . . .	100			
Dec . . .	Remington, at full-cock . . .	29	1 firing-pin screw . . .	Should load at half-cock . . .	150	4	} Springfield . . .	{
	Springfield . . .	25	1 firing-pin spring, 1 firing-pin screw . . .	No remarks . . .	100	2		
	Sharps . . .	25	None reported . . .	Does not eject well after firing in a dusty country . . .	100	1		
1872.								
Jan . . .	Remington, at full-cock . . .	29	1 firing-pin, 1 firing-pin spring . . .	Should load at half-cock . . .			} Springfield . . .	{
	Springfield . . .	25	1 B. B. cap-screw, 1 firing-pin, 1 sear . . .	No remarks . . .				
	Sharps . . .	25	None reported . . .	Does not eject well after firing in a dusty country . . .				
Feb . . .	Remington, at half-cock . . .	20	do . . .	Does not eject shells well . . .	100		} Springfield . . .	{
	Remington, at full-cock . . .	9	2 firing-pin springs . . .	Should load at half-cock . . .				
	Springfield . . .	25	2 B. B. cap-screws, 2 sear-springs, 2 ejector-springs . . .	No remarks . . .	200			
	Sharps . . .	25	1 mainspring, 2 sear-springs . . .	Does not eject well after firing in a dusty country . . .	100		} Springfield . . .	{
March . . .	Remington, at half-cock . . .	20	None reported . . .	Does not eject shells well . . .	200	1		
	Remington, at full-cock . . .	9	do . . .	Should load at half-cock . . .	200	1		
	Springfield . . .	25	do . . .	No remarks . . .	100	3	} Springfield . . .	{
	Sharps . . .	25	2 sear-springs . . .	Does not eject well after firing in a dusty country . . .				
April . . .	Remington, at half-cock . . .	20	None reported . . .	Does not eject shells well . . .	100	2		
	Remington, at full-cock . . .	9	do . . .	Should load at half-cock . . .	100	3	} Springfield . . .	{
	Springfield . . .	23	do . . .	No remarks . . .	100			
	Sharps . . .	25	do . . .	Does not eject well after firing in a dusty country . . .	100	3	} Springfield . . .	{

{ Lieut. Thomas Garvey,
commanding.

Company A, First Cavalry, Captain Thomas McGregor commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. May	Remington, at half-cock. Remington, at full-cock. Springfield Sharps	19 9 20 25	None reported do do do	Does not eject shells well Should load at half-cock. No remarks Does not eject well after firing in a dusty country.	200 300 100	10 18 7	Springfield...	{ Lieut. M. Wesendorff, commanding.
June	Remington, at half-cock Remington, at full-cock Springfield Sharps	19 8 23 25	do do do do	No remarks do do do	300 100 100	3 4 2	Springfield...	
July	Remington, at half-cock Remington, at full-cock Springfield Sharps	19 8 22 25	do do do do	do do do do			Springfield...	
Aug	Remington, at half-cock Remington, at full-cock Springfield Sharps	19 8 20 25	do do do do	do do do do	100 100 200	3 2 7	Springfield...	
Oct	Remington, at half-cock Remington, at full-cock Springfield Sharps	19 8 21 25	1 barrel None reported 1 front-sight, 1 stock None reported	do do do do	100 150 100	2 2 1	Springfield...	
Nov	Remington, at half-cock Remington, at full-cock Springfield Sharps	19 8 21 25	1 stock, 1 rear-sight 3 stocks 2 stocks, 1 barrel None reported	do do do do	200 100 100	2 1 1	Springfield...	
Dec	Remington, at half-cock Remington, at full-cock Springfield Sharps Ward-Burton	19 8 21 25 18	do do do do do	do do do do do	150 100 100	2 1 1	Springfield...	
1873. Jan	Remington, at half-cock Remington, at full-cock Springfield Sharps Ward-Burton	19 8 20 25 18	do do do do do	do do do do Ward-Burton has not been subjected to field-service.	200 150 200 200	4 2 3	Springfield...	

TOTALS.

Kind of arms.	Orig- nally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, at half-cock.....	20	1 barrel, 1 stock, 1 rear-sight.....	2,500	48
Remington, at full-cock.....	9	3 stocks, 1 rear-sight, 1 mainspring, 1 trigger-spring, 1 lever-spring, 1 firing-pin		
Springfield.....	25	screw, 3 firing-pin springs.	2,100	47
		3 stocks, 1 front-sight, 1 barrel, 1 ejector-spring, 1 cam-latch spring, 1 mainspring, 1 tumbler-		
Sharps.....	25	screw, 1 firing-pin spring, 1 firing-pin screw, 3 B. B. cap-screws, 1 firing-pin, 1 sear, 2 sear-	1,800	35
Ward-Burton.....	18	springs, 1 ejector-spring.		
		1 ejector-spring, 1 lever-spring, 2 tumbler-screws, 1 mainspring, 4 sear-springs.....	200	.....
		None reported.....		

Company I, First Cavalry, Lieutenant A. Grant commanding; Remington, Springfield, and Sharps carbines issued July 1, 1871.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. July...	Remington, at half-cock. Remington, at full-cock.	20 4	None reported.....do.....	No remarks..... Dangerous; recoil too great; extractor almost worthless.....	100	.....	Springfield...	
	Springfield..... Sharps.....	28 24	do..... .....do.....	No remarks..... Model out of date; very troublesome to load; recoil very great.	100 100	.....		
Aug...	Remington, at half-cock. Remington, at full-cock.	20 3	1 tumbler..... 1 stock.....	No remarks..... .....do.....	270 270	.....		
	Springfield..... Sharps.....	24 24	None reported.....do.....	do..... .....do.....	270	.....	Springfield...	
Oct....	Remington, at half-cock Springfield.....	14 11	5 rear-sights, 3 mainsprings 3 rear-sights.....	do..... .....do.....	920	10		
	Sharps.....	20	None reported	do.....			Springfield...	
Nov...	Remington, at full-cock Springfield.....	10 14	1 stock..... None reported	do..... .....do.....	232	6		
	Sharps.....	20	1 lock-plate.....	do.....			Springfield...	
Dec....	Remington, at full-cock Springfield.....	14 11	None reported.....do.....	do..... .....do.....	150	.....		
	Sharps.....	20	do.....	do.....				

Company I, First Cavalry, Lieutenant A. Grant commanding—Continued.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired	Cartridges failed.
Remington, at half-cock.....	20	1 tumbler, 5 rear-sights, 3 mainsprings	}	370
Remington, at full cock	4	2 stocks.....		370
Springfield.....	28	3 rear-sights		370
Sharps.....	24	1 lock-plate.....		370

Company B, Second Cavalry, Lieutenant R. Norwood commanding.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept....	Sharps.....	76	2 stocks, 3 breech-straps	A reduced charge for cartridge; recoil very great.	2,020	40	Sharps.....	

Company C, Second Cavalry, Captain E. J. Spaulding commanding; Remington, Springfield, and Sharps carbines issued June 20, 1871; Ward-Burton carbines issued May 28, 1872.

1871. July...	Remington, at half-cock Springfield.....	28 28	None reported	No remarks.....	.....	.....	Not given..	.....
Aug...	Sharps.....	28	do.....	do.....	.....	.....	} Remington at half-cock.	.....
	Remington, at half-cock	20	do.....	do.....	300	.....		.....
	Remington, at full-cock	8	do.....	do.....	300	.....		.....
	Springfield.....	28	do.....	do.....	200	.....		.....
Sept...	Sharps.....	28	do.....	do.....	.....	.....	} Remington at half-cock.	.....
	Remington, at half-cock	20	do.....	To have an ejector-spring; tip of front-sight to be nickel or brass.	1,336	.....		.....
	Remington, at full-cock	8	do.....	No remarks.....	1,336	.....		.....
	Springfield.....	28	do.....	do.....	1,336	.....		.....
	Sharps.....	28	do.....	do.....	1,336	220		.....

Oct ...	Remington, at half-cock	20	do	To have an ejector-spring; tip of front-sight to be nickel or brass.	350	50	Remington, at half-cock.
	Remington, at full-cock	8*	do	No remarks.			
	Springfield	28	do	do	350	50	
	Sharps	23	do	do	350	50	
Nov ...	Remington, at half-cock	20	do	To have an ejector-spring; tip of front-sight to be nickel or brass.	200	20	Remington, at half-cock.
	Remington, at full-cock	8	do	No remarks.			
	Springfield	28	do	do	200	20	
	Sharps	28	do	do	200	20	
Dec....	Remington, at half-cock	20	do	To have an ejector-spring; tip of front-sight to be nickel or brass.			Remington, at half-cock.
	Remington, at full-cock	8	do	No remarks.			
	Springfield	28	do	do			
	Sharps	28	do	Small of the stocks are too weak.			
1872.							
Jan....	Remington, at half-cock	20	do	To have an ejector-spring; tip of the front-sight to be nickel or brass.			Not given...
	Remington, at full-cock	8	do	No remarks.			
	Springfield	28	do	do			
	Sharps	24	do	Small of the stocks are too weak.			
Feb....	Remington, at half-cock	20	do	To have an ejector-spring; tip of the front-sight to be nickel or brass.			Remington, at half-cock.
	Remington, at full cock	4	do	No remarks.			
	Springfield	26	do	do			
	Sharps	25	do	Small of the stocks are too weak.			
March	Remington, at half-cock	20	do	No remarks.			Remington, at half-cock.
	Remington, at full-cock	3	do	do			
	Springfield	26	do	do			
	Sharps	26	do	do			
April ..	Remington, at half-cock	20	do	do			Remington, at half-cock.
	Remington, at full-cock	3	do	do			
	Springfield	26	do	do			
	Sharps	26	do	do			
June...	Remington, at half-cock	7	do	do			Remington, at half-cock.
	Remington, at full-cock	7	do	do			
	Springfield	17	do	do	1,000		
	Sharps	18	do	do			
	Ward-Burton	21	do	do			
July ...	Remington, at half-cock	7	do	do		6	Remington at half-cock.
	Remington, at full-cock	7	do	do	300	3	
	Springfield	17	do	do	150	7	
	Sharps	18	do	do	200		
	Ward-Burton	21	3 stocks.	do	200		
	Remington, at half-cock	5	2 stocks.	do			
Sept ...	Remington, at full-cock	5	do	do			
	Springfield	17	None reported	do	1,000	10	Remington, at half-cock.
	Sharps	17	1 stock.	do			
	Ward-Burton	19	2 stocks.	do			

Company C, Second Cavalry, Captain E. J. Spaulding commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Oct . . .	Remington, at half-cock.	12	1 stock	Should have ejector to throw shells clear of barrel.	500	18	Springfield . . .	Without any improve- ments prefers the Springfield. Small of stock should be strengthened in all the arms.
	Remington, at full-cock .	2	None reported	No remarks				
	Springfield	17	1 stock, 1 barrel	do				
	Sharps	18	None reported	do				
	Ward-Burton	21	2 stocks	do				Same remarks as Octo- ber.
	Remington, at half-cock .	11	1 stock	Should have ejector to throw shells clear of barrel.	120	3	Springfield . . .	
	Remington, at full-cock .	3	None reported	No remarks				
	Springfield	17	1 stock, 1 side-screw	do	130	5	Springfield . . .	
	Sharps	18	1 stock	do	125	6		
	Ward-Burton	21	None reported	Mainspring is too weak	125	9		
	Remington, at half-cock .	12	1 stock	Should have ejector to throw shells clear of barrel.	500	14		
Dec . . .	Remington, at full-cock .	2	None reported	No remarks			Not given . . .	
	Springfield	17	1 stock, 1 barrel	do				
	Sharps	18	None reported	do				
	Ward-Burton	21	2 stocks	Mainspring is too weak				
1873. Jan . . .	Remington, at full-cock .	7	None reported	Should load at half-cock	100		Remington, at full-cock.	
	Springfield	12	do	No remarks	210			
	Sharps	16	do	do	100			
	Ward-Burton	18	do	The small of the stock should be strength- ened.	130			
TOTALS.								
Kind of arms.				Broken parts belonging to the system.		Cartridges fired.	Car- tridges failed.	
Remington, at half-cock				20	5 stocks	} 2,470	} 111	
Remington, at full-cock				8	2 stocks			
Springfield				28	3 stocks, 2 barrels, 1 side-screw			
Sharps				28	2 stocks			
Ward-Burton				21	9 stocks	1,175	83	
						455		

Company E, Second Cavalry, Captain Elijah R. Wells commanding; Remington, Springfield, and Sharps carbines issued June 20, 1871, and the Ward-Burton arms issued May 27, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Dec	Remington, at half-cock .	20	2 barrels burst, 5 hammers, 3 mainsprings, 3 trigger-springs, 1 firing-pin, 1 firing-pin spring, 1 lever-spring.	Difficult to extract the shells after firing--	3,700*		Sharps.....	* 2 per cent. lost.
	Remington, at full-cock .	8	1 butt-stock.....	No remarks.....				
	Springfield.....	27	2 barrels, 3 mainsprings, 1 cam- latch spring, 1 sear-spring, 2 tumbler-screws, 1 firing-pin, 1 firing-pin spring, 2 firing-pin screws, 3 ejector-springs.	do.....				
	Sharps	27	1 stock, 3 main-springs, 4 tumb- ler-screws, 1 tumbler, 2 firing- pins, 1 lever-spring.	Should be sighted more accurately				
1872. Mar	Remington, at half-cock .	16	4 firing-pins, 3 firing-pin springs, 2 firing-pin screws, 1 lever- spring.	Difficult to extract the shells after firing.	2,650	2 per ct.	Sharps.....	
	Remington, at full-cock .	8	1 firing-pin, 1 firing-pin spring, 2 lever-springs.	No remarks.....				
	Springfield.....	25	1 stock, 1 lock, 3 tumbler-screws, 3 tumblers, 2 cam-latch springs.	do.....				
April ..	Sharps.....	26	4 tumbler-screws, 1 lever-spring.	Should be sighted more accurately.....	800		Sharps.....	
	Remington, at half-cock .	16	None reported	No remarks.....				
	Remington, at full-cock .	8	do.....	do.....				
	Springfield.....	25	do.....	The breech-block liable to open from jolt- ing against the saddle.	800	1 per ct.	Sharps.....	
	Sharps	26	1 lock	No remarks.....				
	Remington, at half-cock	13	None reported	do.....				
May ...	Remington, at full-cock ..	8	do.....	The Schofield hammer should be used.....	800		Sharps.....	
	Springfield.....	24	do.....	The breech-block liable to open from jolt- ing against the saddle.				
		Sharps	25	do.....					No remarks.....
June....	Remington, at half-cock .	13	do.....	Does not extract the shell properly	1,000	1 per ct.	Springfield.....	
	Remington, at full-cock ..	8	do.....	do.....				
	Springfield.....	24	do.....	For general service the Springfield is the best arm.				
	Sharps	25	do.....	Should be sighted more accurately.....	1,000	1 per ct.	Springfield.....	
	Ward-Burton	21	do.....	Too complicated for cavalry service.....				

Company E, Second Cavalry, Captain Elijah R. Wells commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. July . . .	Remington, at half-cock. Remington, at full-cock. Springfield . . .	6 8 16	None reported . . . do . . . 1 stock . . .	Does not extract the shell properly . . . do . . . For general service the Springfield is the best arm.	1, 104		Springfield . . .	
Aug . . .	Sharps . . . Ward-Burton . . . Remington, at half-cock. Remington, at full-cock. Springfield . . . Sharps . . . Ward-Burton . . .	18 21 6 8 16 18 21	None reported . . . do . . . do . . . do . . . do . . . do . . . do . . .	Should be sighted more accurately . . . Too complicated for cavalry service . . . No remarks . . . do . . . do . . . do . . . do . . .	1, 104		Springfield . . .	
Sept . . .	Ward-Burton . . . Remington, at half-cock. Remington, at full-cock. Springfield . . .	6 8 16	do . . . do . . . do . . . do . . .	Does not extract the shell properly . . . do . . . For general service the Springfield is the best arm.	1, 024		Springfield . . .	See special report.
Oct . . .	Sharps . . . Ward-Burton . . . Remington, at half-cock. Remington, at full-cock. Springfield . . .	18 21 6 8 16	do . . . do . . . None reported . . . 1 rear-sight . . . 1 stock . . .	Should be sighted more accurately . . . Too complicated for cavalry service . . . Does not extract the shells properly . . . do . . . For general service the Springfield is the best arm.	480		Springfield . . .	See special report.
Nov . . .	Sharps . . . Ward-Burton . . . Remington, at half-cock. Remington, at full-cock. Springfield . . .	18 21 6 6 12	2 stocks . . . None reported . . . do . . . do . . . do . . .	Should be sighted more accurately . . . Too complicated for cavalry service . . . Does not extract the shells properly . . . do . . . For general service the Springfield is the best arm.			Springfield . . .	See special report.
Dec . . .	Sharps . . . Ward-Burton . . . Remington, at half-cock. Remington, at full-cock. Springfield . . .	16 21 6 6 12	do . . . do . . . do . . . do . . . do . . .	Should be sighted more accurately . . . Too complicated for cavalry service . . . Does not extract the shells properly . . . do . . . For general service the Springfield is the best arm.	1, 083	1 per ct.	Springfield . . .	See special report.
1873. Jan . . .	Sharps . . . Ward-Burton . . . Remington, at half-cock. Remington, at full-cock. Springfield . . . Sharps . . . Ward-Burton . . .	16 21 6 6 12 16 21	do . . . do . . . do . . . do . . . do . . . do . . . do . . .	Should be sighted more accurately . . . Too complicated for cavalry service . . . Does not extract the shells properly . . . do . . . For general service the Springfield is the best arm.	640	1 per ct.	Springfield . . .	See special report.

Feb...	Remington, at half-cock	6	do	Does not extract the shells properly.....	48	Springfield.....
	Remington, at full-cock	6	do	do	48	do
	Springfield	12	do	Should be sighted more accurately.....	116	do
	Sharps	29	do	Too complicated for mounted service	84	10
	Ward-Burton	20	do			

TOTALS.

Kind of arms.	Orig- inally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, at half-cock.....	20	2 barrels burst, 5 hammers, 3 mainsprings, 2 firing-pin screws, 3 trigger-springs, 5 firing-pins, 4 firing-pin springs, 2 lever-springs.	48	.....
Remington, at full-cock.....	8	1 firing-pin spring, 2 lever-springs, 1 butt-stock, 1 rear-sight.....	48	.....
Springfield.....	27	2 barrels, 3 mainsprings, 3 cam-latch springs, 1 sear-spring, 5 tumbler-screws, 1 firing-pin, 1 firing-pin spring, 2 firing-pin screws, 3 ejector-springs, 3 stocks, 1 lock, 3 tumblers.	116	.....
Sharps.....	27	3 stocks, 3 mainsprings, 8 tumbler-screws, 1 tumbler, 2 firing-pins, 2 lever-springs, 1 lock.....	84	10
Ward-Burton.....	21	None reported.....		

Special report made by Captain E. R. Wells, Second Cavalry, September, 1872.—I have the honor to report that I have used the experimental arms a long time, and find that the Sharps' carbine fouls in the breech by use, and, after being fired a number of times, the lever-bar does not work smoothly; also, the extractor does not extract the shells properly. The Remington, also, does not extract the shells properly. The extractor only draws the shell a short distance, when they have to be taken out with the fingers. Sometimes they expand, and cannot be withdrawn without considerable difficulty.

The Ward-Burton fails often to explode the cartridge, which is caused by the firing-pin spring becoming weak. The extractor is good, but as the piece is always cocked, and there are so many motions which consume time in working the gun, it is not, in my opinion, adapted for the cavalry service.

The Springfield has a good extractor. The firing-pin does not become weak, and it is no more liable to get out of order than either of the other guns. It is well made, and is, in my opinion, the best carbine in use for cavalry service.

Company I, Second Cavalry, Captain Henry E. Noyes commanding.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept...	Sharps.....	71	None reported.....	No remarks.....	630	33	.....	

Company C, Third Cavalry, Lieutenant W. W. Robinson commanding.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.	Sharps	78	1 stock	No remarks	2,000	.....	.....	.....

Company D, Third Cavalry, Captain Guy V. Henry commanding; Remington, Springfield, and Sharps carbines issued May 13, 1872; Ward-Burton carbines issued May 28, 1872.

1872.	Sharps	63	None reported	No remarks	360	.....	.....	.....
June...	Ward-Burton	7	do	do	200	.....	Sharps .....	.....
July...	Remington, at full-cock	7	do	do	40	.....	.....	.....
	Springfield	7	do	do	40	.....	Springfield .....	.....
	Sharps	70	do	do	380	.....	.....	.....
	Ward-Burton	7	do	do	40	.....	.....	.....
Aug...	Remington, at full-cock	7	do	do	80	9	.....	.....
	Springfield	7	do	do	80	11	.....	.....
	Sharps	69	do	do	510	4	Springfield .....	.....
	Ward-Burton	7	do	do	80	23	.....	.....
Sept...	Remington, at full-cock	7	do	do	105	6	.....	.....
	Springfield	7	do	do	105	8	Springfield .....	.....
	Sharps	40	do	do	585	2	.....	.....
	Ward-Burton	7	do	do	105	14	.....	.....

TOTALS.

Kind of arms.	Orig- inally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, at full-cock	7	None reported	225	15
Springfield	7	do	225	19
Sharps	63	do	1,835	6
Ward-Burton	7	do	425	37

Company F, Third Cavalry, Captain Alex. Moore commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Dec....	Remington, at half-cock. Remington, at full-cock. Springfield..... Sharps..... Ward-Burton.....	5 2 7 63 7	None reported do do do do	No remarks. do do do do	130 150 320 150	20 5 18 9	Springfield...	{ Lieut. A. De B. Smead commanding.
1873. Jan....	Remington, at half-cock. Remington, at full-cock. Springfield..... Sharps..... Ward-Burton.....	5 2 7 63 7	do do do do do	do do do do do	140 150 330 160	25 5 20 11	Springfield...	{ Lieut. A. De B. Smead commanding.

TOTALS.

Kind of arms.	Orig- inally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, at half-cock..... Remington, at full-cock..... Springfield..... Sharps..... Ward-Burton.....	5 2 7 52 7	2 hammers None reported do do do	870 900 2,450 910	75 25 78 53

Company L, Third Cavalry, Captain Thomas L. Brent commanding.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept....	Sharps.....	73	None reported.....	Sight too coarse; front sight too low; smaller charge of powder.	560	20	Sharps.....	

Company M, Third Cavalry, Captain Anson Mills commanding

1872.	Sharps.....	92	None reported.....	No remarks.....	900	6	Remington, at half-cock.
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Company F, Fourth Cavalry, Captain Wirt Davis commanding.

1873. Feb....	Sharps.....	80	None reported.....	No remarks.....	550	23	Springfield.....
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Company H, Fourth Cavalry, Captain S. Gunther commanding.

1873. Feb....	Sharps.....	73	None reported.....	No remarks.....	520	50	Springfield.....
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Company K, Fourth Cavalry, Captain E. M. Heyl commanding; Remington, Springfield, and Sharps carbines, issued August 5, 1871; Ward-Burton issued June 4, 1872.

1871. Sept ...	Remington, at full-cock. Springfield	28 28	None reported..... do	To load at half-cock..... No remarks.....	.....	.....	Springfield.....
Oct	Sharps..... Remington, at full-cock. Springfield	28 27 28	do	do .....	.....	13	Springfield.....
Nov ...	Sharps..... Remington, at half-cock. Springfield	28 27 28	2 barrels burst	The ejector to be made 1-16 inch longer ..	1,000	10	Springfield.....
Dec....	Sharps..... Remington, at half-cock. Springfield	28 27 26	None reported	No remarks.....	1,000	12	Springfield.....
	Sharps.....		do	do	300	4	Springfield.....
	Sharps.....		do	The ejector to be made 1-16 inch longer ..	300	2	Springfield.....
	Sharps.....		do	Very difficult to load while mounted; hammer in the way.	300	5	Springfield.....
	Remington, at half-cock. Springfield	22 27	do	No remarks.....	.....	.....	Springfield.....
	Sharps.....	26	do	The ejector to be made 1-16 inch longer ..	.....	.....	Springfield.....
	Sharps.....		do	Very difficult to load while mounted; hammer in the way.	.....	.....	Springfield.....
1872. Jan....	Remington, at half-cock. Springfield	22 27	do	No remarks.....	.....	.....	Springfield.....
	Sharps.....	26	do	The ejector to be made 1-16 inch longer ..	.....	.....	Springfield.....
	Sharps.....		do	Very difficult to load while mounted; hammer in the way.	.....	.....	Springfield.....

Company K, Fourth Cavalry, Captain E. M. Heyl commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
Feb....	Remington, at half-cock.	22	None reported.	No remarks.....				
	Springfield	27	do	The ejector to be made 1-16 inch longer ..			Springfield...	
	Sharps	26	do	Very difficult to load while mounted; hammer in the way.				
March ..	Remington, at half-cock.	20	do	To have an ejector	150	9		
	Springfield	27	do	The ejector to be made 1-16 inch longer ..	170	7	Springfield...	
	Sharps	26	do	Very difficult to load while mounted; hammer in the way.	140	12		
April ..	Remington, at half-cock.	27	do	To have an ejector	200	40		
	Springfield	20	do	The ejector to be made 1-16 inch longer ..	200	32	Springfield...	
	Sharps	26	do	Very difficult to load while mounted; hammer in the way.	200	41		
May ...	Remington, at half-cock.	20	do	To have an ejector	245	20		
	Springfield	27	do	The ejector to be made 1-16 inch longer ..	245	14	Springfield...	
	Sharps	26	do	Very difficult to load while mounted; hammer in the way.	245	36		
June ...	Remington, at half-cock.	27	do	To have an ejector				
	Springfield	20	5 stocks, 5 rear-sights, 1 breech-block.	The ejector to be made 1-16 inch longer ..				
	Sharps	26	None reported	Very difficult to load while mounted; hammer in the way.			Springfield....	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, at full-cock	28	2 barrels	1,895	86
Springfield.....	28	9 stocks, 5 rear-sights, 1 breech-block.....	1,915	65
Sharps.....	28	None reported	1,885	106

Company A, Fifth Cavalry, Lieutenant A. E. Woodson commanding.

Date of re- port.	Kind of arms.	On hand	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Oct	Remington, at half-cock	6	None reported	No remarks	105	4	} Springfield . . .	
	Remington, at full-cock	1	do	To load at half-cock	231	1		
	Springfield	11	do	No remarks	1, 104	19		
	Sharps	57	do	do	42	1	} Springfield . . .	
	Remington, at half-cock	7	do	To load at half-cock				
Nov	Remington, at full-cock	1	1 lock	No remarks	90	2		
	Springfield	11	None reported	No remarks	210	11		
	Sharps	57	do	do				

TOTALS.

Kind of arms.		Orig- inally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, at half-cock		6	None reported	147	5
Remington, at full-cock		1	1 lock	321	3
Springfield		11	None reported	1, 314	30
Sharps		57	do		

Company K, Fifth Cavalry, Captain J. W. Mason commanding.

Date of re- port.	Kind of arms.	On hand	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept	Sharps	76	9 scar-springs, 2 stocks		6, 150	250	Springfield	

Company D, Sixth Cavalry, Captain John A. Irwin commanding; Remington, Springfield, and Sharps carbines issued October 1, 1871; Ward-Burton carbines issued June 25, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept . . .	Remington, at half-cock. Remington, at full cock. Springfield. Sharps. Ward-Burton	11 9 22 20 18	1 barrel burst 1 trigger-spring 1 barrel burst, 1 barrel-spring 2 lever-springs 2 guard-screws	No remarks do do do do	120 120 120 120	10 5 5 5	Springfield..	

Company G, Sixth Cavalry, Captain T. C. Tupper commanding.

1872. Sept . . .	Sharps	56	None reported	No remarks	820	164	Remington, at half-cock.	
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Company H, Sixth Cavalry, Captain Sheldon Sturgeon commanding.

1872. Sept . . .	Sharps	81	1 stock, 4 tumbler-screws	No remarks	3,000	223	Sharps	
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Company L, Sixth Cavalry, Captain C. B. McClellan commanding; Ward-Burton carbines issued June 8, 1872.

1872. Sept . . . Nov . . .	Ward-Burton do	18 18	None reported do	Unfit for cavalry service No remarks	400	100	Springfield do	
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Company F, Seventh Cavalry, Captain George W. Tate commanding; Remington, Springfield, and Sharps carbines issued June 13, 1871; Ward-Burton carbines issued April 16, 1872.

1872. Aug ...	Remington, at full-cock.	21	None reported	To load at half-cock.	125	6	See special report.*
	Springfield.....	21	do	No remarks.....	125	7	.....
	Sharps.....	21	do	do	125	6	.....
	Ward-Burton	21	do	do	125	6	.....

* *Copy of a special report made by Lieutenant Larned, Seventh Cavalry, May 31, 1872.*— * * * Whenever the arms were in the hands of the men, it was noticed that the piece seemingly requiring the least attention in manipulation of loading was the Government Springfield carbine. A proper allowance, however, should be made in that respect in favor of the Ward-Burton and Remington, both of which, and particularly the former, are less familiar to them than the Springfield.

For rapidity of fire there appears to be little choice between the Ward-Burton and the Springfield, both of which excel in that respect the Remington, as their facilities for ejecting cartridges are superior to those of the latter. This superiority appears to arise from the fact, first, of their greater leverage, by which a tight cartridge is withdrawn without difficulty, the same also affecting its insertion; second, that in the latter piece the thumb, in drawing back the breech-block, is generally in the way of the falling cartridge. * * *

The mechanism of the former, although somewhat cumbersome, appears to be sufficiently strong, and to perform all its functions with the greatest efficiency. I should suggest the somewhat unnecessary size of the lever-knob, and the unsatisfactory substitute for a half-cock. As regards the Remington, I should suggest the necessity of some arrangement by which the piece could be loaded at a half-cock; also a more powerful and efficient ejecting-mechanism. * * *

Company K, Seventh Cavalry, Captain Owen Hale commanding; Remington, Springfield, and Sharps carbines issued June 15, 1871; Ward-Burton carbines, issued April 16, 1872.

1871. Aug ...	Remington, at full-cock.	28	None reported	No remarks.....	50	3	.....
	Springfield.....	28	do	do	50	1	.....
	Sharps.....	28	do	do	50	2	.....

Company D, Ninth Cavalry, Captain F. S. Dodge commanding.

1872.							
Aug	Sharps	80	2 scars	No remarks	200		
Sept	do	80	1 stock	More effective ejector	250	3	

Company D, Ninth Cavalry, Captain F. S. Dodge commanding—Continued.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Sharps.....	80	2 sears, 1 stock.....	450	3

Company L, Ninth Cavalry, Captain E. S. Meyer commanding; Remington, Springfield, and Sharps carbines issued August 5, 1871; Ward-Burton carbines issued June 4, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Oct....	Remington, at half-cock.	20	None reported	No remarks	25			
	Remington, at full cock.	7	1 rear-sight leaf, 1 front-sight	Rear-sight spring should be stronger.				
	Springfield.....	27	None reported	Rear-sight spring should be stronger.	25			
	Sharps.....	27	do	No remarks	25			
	Remington, at half-cock.	19	2 rear-sight leaves, 2 stocks	Rear-sight spring should be stronger and front sight.	170	6		
Nov...	Remington, at full cock.	8	None reported	Rear-sight spring should be stronger.	170			
	Springfield.....	27	1 stock	No remarks	170	2		
	Sharps.....	27	None reported	do				
	Remington, at half-cock.	19	do	Modify hammer or breech-block, so that more forcible blow be given firing-pin.	145	3		
Dec....	Remington, at full cock.	8	do	No remarks	145	1		
	Springfield.....	27	2 rear-sight leaves	do	145	2		
	Sharps.....	27	None reported	do				
1872.								
Jan....	Remington, at half-cock.	19	do	Modify hammer or breech-block, so that more forcible blow be given firing-pin.	86	2		
	Remington, at full-cock.	8	do	No remarks	80		Springfield...	
	Springfield.....	27	do	do	80	1		
	Sharps.....	27	do	do				
	Remington, at half-cock.	19	do	Modify hammer or breech-block, so that more forcible blow be given firing-pin.	46	1		
Feb....	Remington, at full-cock.	8	do	No remarks	47			
	Springfield.....	27	do	do	47	1		
	Sharps.....	27	do	do				

March	Remington, at half-cock.	19	None reported	Modify hammer or breech-block so that more forcible blow be given firing-pin.	50	Springfield...
	Remington, at full-cock	8	do	No remarks.	50	
	Springfield.	27	do	do	50	
	Sharps.	27	do	do	50	
April	Remington, at half-cock.	19	do	Modify hammer or breech-block so that more forcible blow be given firing-pin.	10	Springfield...
	Remington, at full-cock	8	do	No remarks.	10	
	Springfield.	27	1 rear-sight leaf.	do	10	
	Sharps.	27	None reported	Modify hammer or breech-block so that more forcible blow be given firing-pin.	10	
July	Remington, at half-cock.	16	1 stock, 1 rear-sight	No remarks.	335	
	Remington, at full-cock	4	1 stock.	Rear-sight leaf to be made so as to lie either way.	360	Springfield...
	Springfield.	20	2 stocks, 2 rear-sights	No remarks.	340	
Aug	Sharps.	20	1 stock, 4 mainsprings.	Modify hammer or breech-block so that more forcible blow be given firing-pin.	180	
	Remington, at half-cock.	16	None reported	No remarks.	180	
	Remington, at full-cock	4	do	do	180	
	Springfield.	20	1 barrel burst	do	180	
	Sharps.	20	None reported	do	180	
	Ward-Burton	19	do	Mechanism such as to render it unsuitable for mounted service.	160	
Sept	Remington, at half-cock.	16	do	Modify hammer or breech-block so that more forcible blow be given firing-pin.	160	
	Remington, at full-cock	4	do	No remarks.	160	
	Springfield.	20	do	do	160	
	Sharps.	20	do	do	160	
	Ward-Burton	19	do	Mechanism such as to render it unsuitable for mounted service.	160	
Oct	Remington, at half-cock.	16	do	Modify hammer or breech-block so that more forcible blow be given firing-pin.	110	
	Remington, at full-cock	4	do	No remarks.	110	
	Springfield.	20	do	do	110	
	Sharps.	20	do	do	110	
	Ward-Burton	20	do	Mechanism such as to render it unsuitable for mounted service.	110	
Nov	Remington, at half-cock.	4	do	Modify hammer or breech-block so that more forcible blow be given firing-pin; butt-stocks to be made stronger.	120	
	Remington, at full-cock	16	1 extractor	No remarks.	120	
	Springfield.	19	1 rear-sight slide.	do	120	
	Sharps.	19	1 rear-sight	Mechanism such as to render it unsuitable for mounted service.	120	
	Ward-Burton	20	None reported	Modify hammer or breech-block so that more forcible blow be given firing-pin; butt-stocks to be made stronger.	120	
Dec	Remington, at half-cock.	4	do	No remarks.	120	
	Remington, at full-cock.	16	do	do	120	
	Springfield.	19	do	do	120	
	Sharps.	19	do	Mechanism such as to render it unsuitable for mounted service.	120	
	Ward-Burton	20	1 locking-bolt spring	do	120	

{ Lieut. E. D. Dimmick
commanding.{ Lieut. E. D. Dimmick
commanding.

Company L, Ninth Cavalry, Captain Francis Moore commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Kind of arms.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873.								
Jan....	Remington, at half-cock Remington, at full-cock Springfield..... Sharps..... Ward-Burton	4 16 19 19 20	None reported do do do do	Butt-stocks should be made stronger; sliding-sights should be made to fall forward. Same remarks apply to Springfield	152 125 150 163	25 8 23 32	Springfield....	{ Captain Francis Moore commanding.
Feb....	Remington, at half-cock. Remington, at full-cock. Springfield..... Sharps..... Ward-Burton	4 12 14 17 20	do do do do 1 barrel burst.....	Butt-stocks should be made stronger; sliding-sights should be made to fall forward. The same remarks apply to Springfield .. No remarks..... do	150 150 150 150	7 4 9 3	Springfield....	{ Captain Francis Moore commanding.

TOTALS.

Kind of arms.	Origin- ally is- sued.	Broken parts belonging to the system.	Cartridges fired.	Cart- ridges failed.
Remington, at half-cock	20	3 stocks, 1 rear-sight, 2 sight-leaves.....	} 1,633	56
Remington, at full-cock	7	1 stock, 1 extractor, 1 rear-sight leaf, 1 front-sight.....		
Springfield.....	27	1 rear-sight slide, 1 barrel, 3 stocks, 5 rear-sight leaves.....		19
Sharps.....	27	1 stock, 4 mainsprings, 1 rear-sight.....		53
Ward-Burton	20	1 locking-bolt spring, 1 barrel.....		37

2.—ABSTRACTS OF THE MONTHLY REPORTS RECEIVED FROM THE ARTILLERY.

Company D, Second Artillery, Captain E. R. Platt commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. July...	Remington, model 1870..	20	1 barrel swelled.....	No remarks.....	495	10		{ Lieut. R. E. De Russy commanding.
	Springfield, model 1870..	20	None reported.....	do.....	495	6	{ Springfield...	
	Sharps, model 1870.....	20	do.....	do.....	495	23		
Aug.. {	Remington, model 1870..	20	do.....	do.....			{ Springfield...	{ Lieut. R. E. De Russy commanding.
Sept.. {	Springfield, model 1870..	20	do.....	do.....				
Oct.. {								
Nov.. {	Sharps, model 1870.....	20	do.....	do.....				
Dec....	Remington, model 1870..	20	do.....	do.....	166	11	{ Springfield...	{ Lieut. R. E. De Russy commanding.
	Springfield, model 1870..	20	do.....	do.....	166	19		
	Sharps, model 1870.....	20	do.....	do.....	166	6		
1872. Jan....	Remington, model 1870..	19	do.....	do.....			{ Springfield...	
	Springfield, model 1870..	20	do.....	do.....				
	Sharps, model 1870.....	20	do.....	do.....				
Feb....	Remington, model 1870..	19	do.....	do.....			{ Not given.....	
	Springfield, model 1870..	20	do.....	do.....				
	Sharps, model 1870.....	20	do.....	do.....				

TOTALS.

Kind of arms.	Origin- ally is- sued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, model 1870.....	20	1 barrel.....	661	21
Springfield, model 1870.....	20	None reported.....	661	25
Sharps, model 1870.....	20	do.....	661	29

Company F, Second Artillery, Captain Edward B. Williston commanding: Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
June...	Remington, model 1870...	19	None reported	No remarks			Remington, if modified to load at half-cock.	
	Springfield, model 1870...	19	do	do				
	Sharps, model 1870...	19	do	do			Remington, if modified to load at half-cock.	
July...	Remington, model 1870...	19	do	do				
Aug...	Springfield, model 1870...	19	do	do				
Sept...	Sharps, model 1870...	20	do	do				
Oct...								
Dec...	Remington, model 1870...	19	do	do			Springfield*	{ *Remington, if modified to load at half-cock.
	Springfield, model 1870...	19	do	do				
	Sharps, model 1870...	20	do	do				
	Remington, model 1870...	20	1 barrel burst.	do	800 ball			
	Springfield, model 1870...	19	None reported	do	1600 bl'k		Springfield	
	Sharps, model 1870...	20	1 barrel burst.	do				

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870...	19	1 barrel		
Springfield, model 1870...	19	None reported		
Sharps, model 1870...	19	1 barrel		

Company G, Second Artillery, Captain Carle A. Woodruff commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Aug ...	Remington, model 1870... Springfield, model 1870... Sharps, model 1870	19 20 20	None reported do do	Should load at half-cock.....	30 40 30	2	} Springfield...	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870..... Springfield, model 1870..... Sharps, model 1870.....	19 20 20	None reported..... do do	30 40 30	2

Company H, Second Artillery, Captain George T. Olmsted commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. July ...	Remington, model 1870... Springfield, model 1870... Sharps, model 1870.....	20 20 19	None reported do do	To load at half-cock..... No remarks.....	70 60 70	 1	} Remington...	
Aug ...	Remington, model 1870... Springfield, model 1870... Sharps, model 1870.....	20 20 19	do do do	do do do	40 64 48	2 1	} Remington...	
Sept ...	Remington, model 1870... Springfield, model 1870... Sharps, model 1870	20 20 19	do do do	do do do	56 56 64	..... ..... .....	} Remington	

Company H, Second Artillery, Captain George T. Olmsted commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. March.	Remington, model 1870.. Springfield, model 1870.. Sharps, model 1870	20 20 19	None reported .........do 1 barrel burst	No remarks..... .....do .........do	82 91 31	4 2	} Springfield.....	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	None reported.....	248	6
Springfield, model 1870.....	20	do	271	3
Sharps, model 1870.....	19	1 barrel burst.....	213	1

Company M, Second Artillery, Captain A. C. M. Pennington commanding; Remington, Springfield, and Sharps rifle-muskets issued December 16, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Jan.....	Remington, model 1870.. Springfield, model 1870.. Sharps, model 1870	19 20 20	None reported .........do .........do	No remarks..... .....do .........do .....	.....	.....	.....	
Feb.....	Remington, model 1870.. Springfield, model 1870.. Sharps, model 1870	10 11 10	do .........do 1 lever.....	To load at half-cock; lower swivel too small; ramrod too short. No remarks..... Gun-sling in the way; ramrod too short .....	.....	.....	.....	

Mar . . .	Remington, model 1870 . . .	12	None reported . . .	Difference between half-cock and full-cock too slight.			Springfield . . .
	Springfield, model 1870 . . .	11	do . . .	No remarks . . .			
	Sharps, model 1870 . . .	12	1 lever, 1 firing-pin . . .	Gun-sling in the way; ramrod too short . . .			
April . .	Remington, model 1870 . .	12	None reported . . .	Clumsy to throw up for inspection; comb of hammer too short.			
	Springfield, model 1870 . .	10	do . . .	No remarks . . .			
	Sharps, model 1870 . . .	12	do . . .	Too unwieldy . . .			
May . . .	Remington, model 1870 . .	12	do . . .	Clumsy to throw up for inspection; comb of hammer too short.			
	Springfield, model 1870 . .	12	do . . .	No remarks . . .			
	Sharps, model 1870 . . .	12	1 lever . . .	Too unwieldy . . .			
June . . .	Remington, model 1870 . .	19	1 rear-sight . . .	Clumsy to throw up for inspection; comb of hammer too short.			
	Springfield, model 1870 . .	20	None reported . . .	No remarks . . .	336	(*)	
	Sharps, model 1870 . . .	20	2 firing-pins . . .	Too unwieldy . . .			
	Ward-Burton, mod. 1870 . .	20	None reported . . .	No remarks . . .			
July . . .	Remington, model 1870 . .	19	1 barrel swelled . . .	Clumsy to throw up for inspection; comb of hammer too short.	133	3	{ * 9 failed in Ward-Burton which exploded in other arms.
	Springfield, model 1870 . .	20	None reported . . .	No remarks . . .	106	3	
	Ward-Burton, mod. 1870 . .	20	1 trigger-stop screw . . .	No remarks . . .	113	6	
Aug . . .	Remington, model 1870 . .	19	None reported . . .	Clumsy to throw up for inspection; comb of hammer too short.	143		
	Springfield, model 1870 . .	20	1 rear-sight leaf . . .	No remarks . . .	119	102	
	Ward-Burton, mod. 1870 . .	20	None reported . . .	No remarks . . .	118		
Sept . . .	Remington, model 1870 . .	19	do . . .	Clumsy to throw up for inspection; comb of hammer too short.			
	Springfield, model 1870 . .	20	1 rear-sight leaf . . .	No remarks . . .	215	108	
	Ward-Burton, mod. 1870 . .	20	1 firing-pin guide . . .	No remarks . . .			

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870 . . .	19	1 barrel, 1 rear-sight . . .	216	3
Springfield, model 1870 . . .	20	2 rear-sight leaves . . .	225	
Sharps, model 1870 . . .	20	2 levers, 3 firing-pins . . .		
Ward-Burton, model 1870 . . .	20	1 trigger-stop screw, 1 firing-pin guide . . .		

Company E, Third Artillery, Captain A. C. Wildrick commanding.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept . . .	Springfield, model 1870 . . . Sharps, model 1870 . . .	40 19	None reported do	No remarks do	177 123	13 2	} Springfield . . .	

Company H, Third Artillery, Captain D. R. Ransom commanding; Remington, Springfield, and Sharps rifle-muskets issued June 21, 1872; Ward-Burton rifle-muskets issued March 19, 1872.

1872. July . . .	Remington, model 1870 . . . Springfield, model 1870 . . .	19 19	2 mainsprings None reported	To load at half-cock; more powerful ejector. Musket, bayonet, and ramrod to be numbered.	159 165	4 1		
Aug . . .	Ward-Burton, mod. 1870 . . . Remington, model 1870 . . . Springfield, model 1870 . . .	19 19 19	2 stocks None reported do	Stock made stronger; too complicated . . . To load at half-cock; more powerful ejector. Musket, bayonet, and ramrod to be numbered.	183 174 198	6 2 1	 } Springfield . . .	
Sept . . .	Ward-Burton, mod. 1870 . . . Remington, model 1870 . . . Springfield, model 1870 . . . Ward-Burton, mod. 1870 . . .	19 19 19 19	do do do do	Stock made stronger; too complicated . . . To load at half-cock; more powerful ejector. Musket, bayonet, and ramrod to be numbered. Stock made stronger; too complicated . . .	195 145 175 160	8 7 4 6	 } Springfield . . . } Springfield . . .	{ Lieut. Chas. Humphrey { commanding.

TOTALS.

Kind of arms.		Orig- inally issued.	Broken parts belonging to the system.		Cartridges fired.	Car- tridges failed.
Remington, model 1870.....		19	2 mainsprings.....		478	13
Springfield, model 1870.....		19	None reported.....		538	6
Ward-Barton, model 1870.....		19	2 stocks, 1 locking-bolt screw.....		538	20

Company K, Third Artillery, Captain L. L. Livingston commanding; Remington, Springfield, and Sharps rifle-muskets issued April 29, 1871; Ward-Barton rifle-muskets, March 19, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
May...	Remington, model 1870..	19	None reported.....	No remarks.....	130	3	.....	
	Springfield, model 1870..	19	do.....	do.....	103	3	.....	
	Sharps, model 1870.....	19	1 tumbler.....	do.....	75	3	.....	
June...	Remington, model 1870..	19	None reported.....	do.....	189		.....	
	Springfield, model 1870..	19	do.....	do.....	160	8	.....	
	Sharps, model 1870.....	19	do.....	do.....	210		.....	
July...	Remington, model 1870..	19	do.....	do.....	112		.....	
	Springfield, model 1870..	19	do.....	do.....	90		.....	
	Sharps, model 1870.....	19	do.....	do.....	111		.....	
	Remington, model 1870..	19	do.....	do.....	75		.....	{ Lieut. C. M. Callahan commanding.
Aug...	Springfield, model 1870..	19	do.....	do.....	80		.....	
	Sharps, model 1870.....	19	do.....	do.....	78		.....	{ Lieut. C. M. Callahan commanding.
Sept. {	Remington, model 1870..	19	do.....	do.....			.....	
Oct. {	Springfield, model 1870..	19	do.....	do.....			.....	
Nov. {	Sharps, model 1870.....	19	do.....	do.....			.....	
Dec....	Remington, model 1870..	19	do.....	do.....	75		.....	
	Springfield, model 1870..	19	do.....	do.....	60		.....	
	Sharps, model 1870.....	19	do.....	do.....	57		.....	
1872.								
Jan....	Remington, model 1870..	19	do.....	do.....	420		.....	
	Springfield, model 1870..	19	do.....	do.....	450		.....	
	Sharps, model 1870.....	19	1 firing-pin.....	do.....	398		.....	
Feb....	Remington, model 1870..	19	None reported.....	do.....	207		.....	
	Springfield, model 1870..	19	do.....	do.....	261		.....	
	Sharps, model 1870.....	19	do.....	do.....	300		.....	

Company K, Third Artillery, Captain L. L. Livingston commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Mar . . .	Remington, model 1870 . . .	19	None reported	Barrel shortened 4 to 6 inches; to load at half-cock; lengthen thumb-piece of breech-block and hammer.	300	.....	Springfield . . .	
	Springfield, model 1870 . . .	19	do	No remarks	280	.....		
	Sharps, model 1870	19	1 tumbler, 1 firing-pin . . .	do	190	.....		
Apr . . .	Remington, model 1870 . . .	19	None reported	do	510	.....		
	Springfield, model 1870 . . .	19	do	do	440	.....		
	Ward-Burton, model 1870 . . .	19	do	do	540	.....		
May . . .	Remington, model 1870 . . .	19	1 extractor	do	485	.....		
	Springfield, model 1870 . . .	19	None reported	do	360	.....		
	Ward-Burton, model 1870 . . .	19	do	do	595	.....		
June . . .	Remington, model 1870 . . .	19	do	do . . . . .	.....	.....		
	Springfield, model 1870 . . .	19	do	do . . . . .	.....	.....		
	Ward-Burton, model 1870 . . .	19	do	Mainspring too weak . . . .	.....	.....		

{ Lieut. William Arthur, commanding.
{ Several failed in Ward-Burton, which were fired in other arms.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870	19	1 Extractor	2,503	8
Springfield, model 1870	19	None reported	2,281	16
Sharps, model 1870	19	2 tumblers, 2 firing-pins . . .	1,419	3
Ward-Burton, model 1870	19	None reported	1,135	5

Company G, Fourth Artillery, Captain John Mendenhall commanding; Remington, Springfield, and Sharps rifle-muskets issued December 1, 1872; Ward-Burton rifle-muskets issued December 1, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873. Feb. . . .	Remington, model 1870 . . .	19	None reported	No remarks . . . . .	.....	.....		
	Springfield, model 1870 . . .	14	do	do . . . . .	.....	.....		
	Ward-Burton, model 1870 . . .	18	do	do . . . . .	.....	.....		

Company K, Fourth Artillery, Lieutenant George M. Harris commanding.

1873. Feb....	Remington, model 1870.. Springfield, model 1870.. Ward-Burton, model 1870	20 40 20	None reported do do	No remarks do do	50 60 50	 4	
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Company E, Fifth Artillery, Captain D. H. Kinzie commanding.

	Springfield.....	70	None reported	No remarks			
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3.—ABSTRACTS OF THE MONTHLY REPORTS RECEIVED FROM THE INFANTRY.

Company C, Third Infantry, Captain J. A. Snyder commanding; Remington, Springfield, and Sharps rifle-muskets issued May 20, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

1871. June...	Remington, model 1870..	20	1 firing-pin.....	An ejector-spring would be an improvement.	500	.....	Remington...	*1 was fired in Remington.
July ...	Springfield, model 1870..	20	None reported	No remarks	500	1	Remington...	
	Sharps, model 1870.....	20	1 firing-pin.....	Gun-sling in the way; should be removed.	500	2*	Remington...	
	Remington, model 1870..	20	None reported	An ejector-spring would be an improvement.	500	.....	Remington...	
	Springfield, model 1870..	19	do	No remarks	500	.....	Remington...	
Aug ...	Sharps, model 1870.....	17	do	Gun-sling in the way; should be removed.	500	.....	Remington...	
	Remington, model 1870..	20	do	An ejector-spring would be an improvement.	500	3	Remington...	
	Springfield, model 1870..	19	1 stock broken by being run over; 1 barrel bent and stock torn by mad wolf.	No remarks	500	2	Remington...	
	Sharps, model 1870.....	16	do	Gun-sling in the way; should be removed.	500	5	Remington...	
Sept ...	Remington, model 1870..	20	do	An ejector-spring would be an improvement.	500	.....	Remington...	
	Springfield, model 1870..	18	do	No remarks	500	.....	Remington...	
	Sharps, model 1870.....	16	do	Gun-sling in the way; should be removed.	500	2	Remington...	
	Remington, model 1870..	20	do	An ejector-spring would be an improvement.	550	1	Remington...	
Oct	Springfield, model 1870..	18	do	No remarks	550	3	Remington...	
	Sharps, model 1870.....	16	do	Gun-sling in the way; should be removed.	400	1	Remington...	
	Remington, model 1870..	20	do	An ejector-spring would be an improvement.	550	.....	Remington...	
	Springfield, model 1870..	18	do	No remarks	450	.....	Remington...	
Nov ...	Sharps, model 1870.....	16	do	Gun-sling in the way; should be removed.	500	1	Remington...	
	Remington, model 1870..	20	1 main-spring	An ejector-spring would be an improvement.	450	.....	Remington...	
	Springfield, model 1880..	18	do	No remarks	400	.....	Remington...	
	Sharps, model 1870.....	16	do	Gun-sling in the way; should be removed.	550	.....	Remington...	
Dec....	Remington, model 1870..	20	do	An ejector-spring would be an improvement.	450	.....	Remington...	
	Springfield, model 1870..	18	None reported	No remarks	400	.....	Remington...	
	Sharps, model 1870.....	16	do	Gun-sling in the way; should be removed.	550	.....	Remington...	
	Remington, model 1870..	20	do	An ejector-spring would be an improvement.	400	.....	Remington...	

Company C, Third Infantry, Captain J. A. Snyder commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872 Jan	Remington, model 1870	20	1 extractor	An ejector-spring would be an improvement.	550	.....	.....	
	Springfield, model 1870	16	None reported	No remarks	500	.....	Remington	
	Sharps, model 1870	14	1 receiver, 1 barrel and swivel, 1 butt-stock, 1 tang-screw, 1 ramrod, 1 complete, lost in action.	Gun-sling in the way; should be removed.	550	1	.....	
Feb	Remington, model 1870	20	None reported	An ejector-spring would be an improvement.	550	1	.....	
	Springfield, model 1870	16	do	No remarks	400	1	Remington	
	Sharps, model 1870	14	do	Gun-sling in the way; should be removed.	700	2	.....	
Mar	Remington, model 1870	19	do	An ejector-spring would be an improvement.	550	3	.....	
	Springfield, model 1870	16	do	No remarks	340	2	Remington	
	Sharps, model 1870	14	do	Gun-sling in the way; should be removed.	550	7	.....	
April	Remington, model 1870	19	do	An ejector-spring would be an improvement.	350	3	.....	
	Springfield, model 1870	15	1 extractor lost from neglect	No remarks	300	7	Remington	
	Sharps, model 1870	14	None reported	Gun-sling in the way; should be removed.	300	11	.....	
	Ward-Burton, model 1870	20	do	No remarks	550	5	.....	
May	Remington, model 1870	19	do	An ejector-spring would be an improvement.	200	2	.....	
	Springfield, model 1870	15	do	No remarks	179	3	.....	
	Sharps, model 1870	14	do	Gun-sling in the way; should be removed.	400	11	.....	
	Ward-Burton, model 1870	20	do	To be made lighter on trigger	500	4	.....	
June	Remington, model 1870	19	1 firing-spring	An ejector-spring would be an improvement.	300	.....	.....	
	Springfield, model 1870	15	None reported	No remarks	300	.....	Remington	
	Sharps, model 1870	14	do	Gun-sling in the way; should be removed.	350	.....	.....	
	Ward-Burton, model 1870	19	Lost or stolen, 1 musket complete	Too hard on trigger; a dangerous arm in hands of green troops.	350	.....	.....	
July	Remington, model 1870	18	1 stolen	An ejector-spring would be an improvement.	300	1	.....	
	Springfield, model 1870	15	None reported	No remarks	300	1	.....	{ Prefers Springfield or Remington for unit form use.
	Sharps, model 1870	14	do	Gun-sling in the way; should be removed.	300	2	.....	
	Ward-Burton, model 1870	18	1 lost	Too hard on trigger; a dangerous arm in hands of green troops.	600	.....	.....	
Aug	Remington, model 1870	18	None reported	An ejector-spring would be an improvement.	400	.....	.....	
	Springfield, model 1870	14	do	No remarks	400	.....	.....	
	Sharps, model 1870	14	do	Gun-sling in the way; should be removed.	400	2	.....	
	Ward-Burton, model 1870	18	do	Too hard on trigger; a dangerous arm in hands of green troops.	750	.....	.....	

Sept ...	Remington, model 1870...	18	do	do	An ejector-spring would be an improvement.	400	1	.....	Cartridges fired.	Car- tridges failed.
	Springfield, model 1870...	13	do	do	No remarks.....	300	2	.....		
	Sharps, model 1870	14	1 ramrod lost	do	Gun-sling in the way; should be removed.	100	.....	.....		
	Ward-Burton, model 1870	17	1 upper-guard screw	do	Too hard on trigger; should have automatic locking-bolt; a dangerous arm in hands of green troops.	630	.....	.....		
Oct	Remington, model 1870...	18	None reported	do	An ejector-spring would be an improvement.	400	2	.....		
	Springfield, model 1870...	13	do	do	No remarks.....	355	.....	.....		
	Sharps, model 1870	14	do	do	Gun-sling in the way; should be removed.	300	2	.....		
	Ward-Burton, model 1870	16	1 stolen	do	Too hard on trigger; should have automatic locking-bolt; a dangerous arm in hands of green troops.	650	1	.....		
Nov ...	Remington, model 1870...	18	None reported	do	An ejector-spring would be an improvement.	350	1	.....		
	Springfield, model 1870...	13	do	do	No remarks.....	200	1	.....		
	Sharps, model 1870	14	do	do	Gun-sling in the way; should be removed.	350	.....	.....		
	Ward-Burton, model 1870	16	do	do	Too hard on trigger; should have automatic locking-bolt; a dangerous arm in hands of green troops.	600	.....	.....		
Dec.....	Remington, model 1870...	18	do	do	An ejector-spring would be an improvement.	250	1	.....		
	Springfield, model 1870...	13	do	do	No remarks.....	200	.....	.....		
	Sharps, model 1870	14	do	do	Gun-sling in the way; should be removed.	200	1	.....		
	Ward-Burton, model 1870	16	do	do	Too hard on trigger; should have automatic locking-bolt; a dangerous arm in hands of green troops.	790	.....	.....		
1873.	Remington, model 1870...	18	do	do	Should have an ejector-spring.....	200	.....	.....		
Jan	Springfield, model 1870...	13	do	do	No remarks.....	200	1	.....		
	Sharps, model 1870	14	do	do	do	200	.....	.....		
	Ward-Burton, model 1870	16	do	do	Too hard on trigger; should have automatic locking-bolt.	400	.....	.....		
Feb.....	Remington, model 1870...	18	do	do	Should have an ejector-spring.....	100	.....	.....		
	Springfield, model 1870...	14	do	do	No remarks.....	150	1	.....		
	Sharps, model 1870	14	do	do	do	150	.....	.....		
	Ward-Burton, model 1870	16	do	do	Too hard on trigger; should have automatic locking-bolt.	300	2	.....		
TOTALS.										
Broken parts belonging to the system.										
1 firing-pin, 1 firing-pin spring, 1 mainspring, 1 extractor										
No remarks.....										
1 firing-pin.....										
1 upper-guard screw										

Company G, Third Infantry, Captain J. Ford Kent commanding; Remington, Springfield, and Sharps rifle-muskets issued May 20, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870..	16	None reported.....	Does not eject shells; should load at half- cock.	666	.....		
	Springfield, model 1870..	11	do.....	No remarks.....	666	.....	Springfield...	
	Sharps, model 1870	15	do.....	A trigger-guard; does not eject; clogs; gun-sling in the way; dangerous arm.	666	.....		
July...	Remington, model 1870..	19	do.....	Does not eject shells; should load at half- cock.				
	Springfield, model 1870..	19	do.....	No remarks.....	100	10	Springfield...	
	Sharps, model 1870	19	do.....	A trigger-guard; does not eject; clogs; gun-sling in the way; dangerous arm.				
Aug...	Remington, model 1870..	18	do.....	Does not eject shells; should load at half- cock.				
	Springfield, model 1870..	18	do.....	No remarks.....	600	100	Springfield...	
	Sharps, model 1870	18	do.....	A trigger-guard; does not eject; clogs; gun-sling in the way; dangerous arm.				
Sept...	Remington, model 1870..	18	do.....	Does not eject shells; should load at half- cock.				
	Springfield, model 1870..	43	do.....	No remarks.....	900	60	Springfield...	
	Sharps, model 1870	18	do.....	A trigger-guard; does not eject; clogs; gun-sling in the way; dangerous arm.				
Oct....	Remington, model 1870..	16	do.....	Does not eject shells; should load at half- cock.	680	.....	Springfield...	
	Springfield, model 1870..	43	do.....	No remarks.....	1,320	.....		
	Remington, model 1870..	16	1 rear-sight	Does not eject shells; should load at half- cock.	100	.....	Springfield...	
Nov...	Springfield, model 1870..	43	None reported.....	No remarks.....	250	.....		
	Remington, model 1870..	16	1 rear-sight	Does not eject shells; should load at half- cock.	50	.....	Springfield...	
Dec....	Springfield, model 1870..	43	None reported.....	No remarks.....	300	.....	Springfield...	
1872. Jan....	Remington, model 1870..	16	1 rear-sight	Does not eject shells; should load at half- cock.	100	.....	Springfield...	
March..	Springfield, model 1870..	74	None reported.....	No remarks.....	250	.....		
	Remington, model 1870..	16	1 rear-sight	Does not eject shells; should load at half- cock.	400	.....	Springfield...	
June...	Springfield, model 1870..	74	None reported.....	No remarks.....	800	.....		
	Remington, model 1870..	16	do.....	Does not eject shells; should load at half- cock.				
	Springfield, model 1870..	51	1 ejector-spring	No remarks.....	330	.....	Springfield...	

Company H, Third Infantry, Captain Louis T. Morris commanding; Remington, Springfield, and Sharps rifle-muskets issued May 20, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

1871.	Remington, model 1870..	20	None reported	To load at half-cock; means to extract shells.	.....	.....	Springfield...
July. {	Springfield, model 1870..	20	do	No remarks.	.....	.....	.....
Aug	Sharps, model 1870	20	do	do .....	.....	923	5
Sept ...	Remington, model 1870..	20	do	To load at half-cock; means to extract shells.	.....	.....	.....
	Springfield, model 1870..	20	do	No remarks.	.....	923	.....
	Sharps, model 1870	20	Lever and front-sight.	do .....	.....	923	.....
Oct....	Remington, model 1870..	20	None reported	To load at half-cock; means to extract shells.	.....	.....	.....
	Springfield, model 1870..	20	do	No remarks.	.....	.....	.....
	Sharps, model 1870	20	do	do .....	.....	.....	.....
Nov ...	Remington, model 1870..	19	do	To load at half-cock; means to extract shells.	.....	.....	.....
	Springfield, model 1870..	20	do	No remarks.	.....	.....	.....
	Sharps, model 1870	20	do	do .....	.....	.....	.....
Dec....	Remington, model 1870..	16	do	To load at half-cock; means to extract shells.	.....	400	14
	Springfield, model 1870..	19	do	No remarks.	.....	400	.....
	Sharps, model 1870	20	do	do .....	.....	400	15
1872.							
Jan	Remington, model 1870..	16	do	To load at half-cock; means to extract shells.	.....	300	4
	Springfield, model 1870..	19	do	No remarks.	.....	100	.....
	Sharps, model 1870	20	1 lever	do .....	.....	120	.....
Feb....	Remington, model 1870..	16	None reported	To load at half-cock; means to extract shells.	.....	210	.....
	Springfield, model 1870..	19	do	No remarks.	.....	340	.....
	Sharps, model 1870	20	do	do .....	.....	260	.....
Mar....	Remington, model 1870..	16	do	To load at half-cock; means to extract shells.	.....	160	.....
	Springfield, model 1870..	18	do	No remarks.	.....	160	.....
	Sharps, model 1870	20	do	do .....	.....	160	.....
Apr....	Remington, model 1870..	16	do	To load at half-cock; means to extract shells.	.....	140	.....
	Springfield, model 1870..	13	do	No remarks.	.....	50	.....
	Sharps, model 1870	1	Ramrod lost; rear-sight broken.	do .....	.....	40	.....
May ...	Ward-Burton, model 1870	20	None reported	do .....	.....	.....	.....
	Remington, model 1870..	16	1 mainspring	To load at half-cock; means to extract shells.	.....	.....	.....
	Springfield, model 1870..	18	None reported	Springfield is the best arm, less complicated and less liable to get out of order.	.....	180	None..
	Sharps, model 1870	1	do	No remarks.	.....	.....	.....
	Ward-Burton, model 1870	20	do	do .....	.....	.....	.....

{ Lieutenant Thomas S.
Wallace commanding.

{ Lieutenant Thomas S.
Wallace commanding.

Company H, Third Infantry, Captain Louis T. Morris commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. July ...	Remington, model 1870...	14	None reported.....	To load at half-cock; means to extract shells.	890	1	Springfield...	
	Springfield, model 1870...	19	do	The best arm; less complicated and less liable to get out of order.				
	Ward-Burton, model 1870...	20	do	No remarks.....				
Aug ...	Remington, model 1870...	13	do	To load at half-cock; means to extract shells.				
	Springfield, model 1870...	17	1 mainspring.....	The best arm; less complicated and less liable to get out of order.	810	18	Springfield...	
	Ward-Burton, model 1870...	20	1 locking-bolt, 2 upper guard-screws.	No remarks.....				
Sept ...	Remington, model 1870...	14	None reported	To load at half-cock; means to extract shells.				
	Springfield, model 1870...	17	do	The best arm; less complicated and less liable to get out of order.	860	4	Springfield...	
	Ward-Burton, model 1870...	20	do	No remarks.....				
Oct	Remington, model 1870...	12	do	To load at half-cock; means to extract shells.				
	Springfield, model 1870...	17	do	The best arm; less complicated and less liable to get out of order.	620	7	Springfield...	
	Ward-Burton, model 1870...	18	do	No remarks.....				
Nov	Remington, model 1870...	11	1 mainspring.....	To load at half-cock; means to extract shells.	180			
	Springfield, model 1870...	16	None reported	The best arm; less complicated and less liable to get out of order.	140		Springfield...	
	Ward-Burton, model 1870...	19	2 locking-bolts	No remarks.....	220	1		
Dec	Remington, model 1870...	12	None reported	To load at half-cock; means to extract shells.	170			
	Springfield, model 1870...	18	do	The best arm; less complicated and less liable to get out of order.	230		Springfield...	
	Sharps, model 1870	1	do	No remarks.....				
1873. Jan	Ward-Burton, model 1870...	20	2 locking-bolts in target practice.	No remarks.....	260	3		
	Remington, model 1870...	12	None reported	do	120	1		
	Springfield, model 1870...	16	do	do	80		Springfield...	
	Sharps, model 1870	1	do	do				
	Ward-Burton, model 1870...	19	1 breech-bolt dislocated	do	90			
	Remington, model 1870...	12	None reported	To load at half-cock	270	2		
Feb	Springfield, model 1870...	17	do	No remarks.....	380		Springfield...	
	Sharps, model 1870	1	do	do				
	Ward-Burton, model 1870...	19	3 front guard-screws	3 front guard-screws	520	1		

TOTALS.

Kind of arms.	Orig- inally issued.	Broken parts belonging to the system.		Car- tridges failed.
			Cartridges fired.	
Remington, model 1870.....	20	2 mainsprings	2,873	26
Springfield, model 1870.....	20	1 mainspring	2,803	.....
Sharps, model 1870	20	2 levers, 1 front-sight, 1 rear-sight	1,903	15
Ward-Burton, model 1870.....	20	5 locking-bolts, 5 upper guard-screws	1,090	5

Company K, Third Infantry, Captain Dangerfield Parker commanding.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873. March ..	Springfield, model 1870..	50	None reported	No remarks.....	.....	.....	.....	

Company C, Fourth Infantry, Captain E. M. Coates commanding; Remington, Springfield, and Sharps rifle-muskets issued April 29, 1871; Ward-Burton rifle-muskets issued March 19, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June ...	Remington, model 1870...	20	None reported	No remarks.....	.....	.....	.....	{ Arms not yet in hands
July ...	Springfield, model 1870...	20	do	do .....	.....	.....	.....	{ of the men.
	Sharps, model 1870	20	do	do .....	.....	.....	.....	Not tested.
	Remington, model 1870...	20	do	To be arranged for sling, and to load at half-cock.	.....	.....	.....	
Aug ...	Springfield, model 1870...	20	do	No remarks.....	.....	.....	.....	Remington...
	Sharps, model 1870	20	do	To be arranged for sling .....	.....	.....	.....	
	Remington, model 1870...	20	do	To be arranged for sling, and to load at half-cock.	.....	.....	.....	
Sept ...	Springfield, model 1870...	20	do	No remarks .....	.....	.....	.....	Remington...
	Sharps, model 1870	20	do	To be arranged for sling .....	.....	.....	.....	
	Remington, model 1870...	20	do	To be arranged for sling, and to load at half-cock.	200	1	.....	
	Springfield, model 1870...	20	do	No remarks.....	.....	.....	.....	Remington...
	Sharps, model 1870	20	do	To be arranged for sling .....	.....	.....	.....	

Company C, Fourth Infantry, Captain E. M. Coates commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Oct	Remington, model 1870 . .	20	None reported	To be arranged for sling, and to load at half-cock.	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	To be arranged for sling . . . . .	.....	.....	.....	.....
Nov	Remington, model 1870 . .	20	do	To be arranged for sling, and to load at half-cock.	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	To be arranged for sling . . . . .	.....	.....	.....	.....
Dec	Remington, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	do . . . . .	.....	.....	.....	.....
1872. Jan	Remington, model 1870 . .	20	do	To load at half-cock . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	1 tumbler	To be arranged for sling . . . . .	.....	.....	.....	.....
Feb	Remington, model 1870 . .	20	None reported	To load at half-cock . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	To be arranged for sling . . . . .	.....	.....	.....	.....
March . . .	Remington, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	do . . . . .	.....	.....	.....	.....
	Remington, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
April	Springfield, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	do . . . . .	.....	.....	.....	.....
	Remington, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
May	Springfield, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	do . . . . .	.....	.....	.....	.....
	Remington, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
June	Springfield, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	do . . . . .	.....	.....	.....	.....
	Remington, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	4 firing-pin springs	do . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	None reported	do . . . . .	.....	.....	.....	.....
July	Remington, model 1870 . .	20	do	Should load at half-cock . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	do . . . . .	.....	.....	.....	.....
	Remington, model 1870 . .	20	do	Should load at half-cock . . . . .	.....	.....	.....	.....
Aug	Springfield, model 1870 . .	20	do	No remarks . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	5 firing-pin springs	do . . . . .	.....	.....	.....	.....
	Remington, model 1870 . .	20	None reported	do . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	Should load at half-cock . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	No remarks . . . . .	.....	.....	.....	.....
Oct	Remington, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Springfield, model 1870 . .	20	do	do . . . . .	.....	.....	.....	.....
	Sharps, model 1870	20	do	do . . . . .	.....	.....	.....	.....
1873. Jan	Remington, model 1870 . .	20	do	Should load at half-cock . . . . .	.....	.....	.....	.....

Feb....	Springfield, model 1870..	20	do	No remarks			
	Ward-Burton, mod. 1870.	20	do	do			
	Remington, model 1870..	20	do	Should load at half-cock			
	Springfield, model 1870..	20	do	No remarks			
	Ward-Burton, mod. 1870.	20	do	do			

TOTALS.

Kind of arms.		Orig- inally issued.	Broken parts belonging to the system.				Cartridges fired.	Car- tridges failed.
Remington, model 1870.		20	None reported				200	
Springfield, model 1870.		20	9 firing-pin springs					
Sharps, model 1870		20	1 tumbler					
Ward-Burton, model 1870.		20	None reported					

Company B, Fifth Infantry, Captain A. S. Bennett commanding; Remington. Springfield, and Sharps rifle-muskets issued May 16, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

Date of re- port	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges		Preference.	Remarks.
					fired.	failed.		
1871. Nov ...	Remington, model 1870..	18	None reported	To load at half-cock, and more force given to ejector.	210	1	} Springfield...	
	Springfield, model 1870..	19	do	No remarks	276	3		
	Sharps, model 1870	19	1 lever-catch, 1 breech-block, 1 lever.	More force given to ejector	210	7		
Dec....	Remington, model 1870..	18	None reported	To load at half-cock, and more force given to ejector.	180	2	} Springfield...	
	Springfield, model 1870..	19	do	No remarks	180	1		
	Sharps, model 1870	19	1 rear-sight	Two fail to eject shell on throwing open the breech-block.	180	12		2 fired in Springfield.

Company B, Fifth Infantry, Captain A. S. Bennett commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
Jan . . .	Remington, model 1870..	17	None reported	No remarks	150	3	Springfield...	
	Springfield, model 1870..	19	Barrel enlarged near muzzle	do	210	1	Springfield...	
	Sharps, model 1870	19	None reported	do	90	1	Springfield...	
Feb . . .	Remington, model 1870..	17	1 breech-block catches	Don't allow ejector to throw out the shell.	180	3	Springfield...	
	Springfield, model 1870..	19	None reported	No remarks	240	3	Springfield...	
	Sharps, model 1870	19	1 tumbler, 1 bridle	do	180		Springfield...	
March .	Remington, model 1870..	17	None reported	do	180		Springfield...	
	Springfield, model 1870..	19	do	do	220	4	Springfield...	
	Sharps, model 1870	19	do	do	200		Springfield...	
April . .	Remington, model 1870..	17	Breech-block fails to allow shell to clear the barrel; forced out with ramrod.	do	60		Springfield...	
	Springfield, model 1870..	16	None reported	do	60		Springfield...	
	Sharps, model 1870	4	do	do			Springfield...	
	Ward-Burton, mod. 1870	20	do	do	70		Springfield...	
May . . .	Remington, model 1870..	17	1 rear-sight	do	90	1	Springfield...	
	Springfield, model 1870..	16	None reported	do	110		Springfield...	
	Ward-Burton, mod. 1870.	20	do	do	90	1	Springfield...	
June . . .	Remington, model 1870..	16	do	do	80		Springfield...	
	Springfield, model 1870..	14	do	do	100		Springfield...	
	Ward-Burton, mod. 1870.	20	do	do	130	1	Springfield...	
July . . .	Remington, model 1870..	16	do	do	40	1	Springfield...	
	Springfield, model 1870..	14	do	do	50	1	Springfield...	
	Ward-Burton, mod. 1870.	20	do	do	50		Springfield...	
Aug . . .	Remington, model 1870..	16	do	do	60	1	Springfield...	
	Springfield, model 1870..	14	do	do	60		Springfield...	
	Ward-Burton, mod. 1870.	20	do	do	80		Springfield...	
Sept . . .	Remington, model 1870..	20	do	do	100	6	Springfield...	
	Springfield, model 1870..	17	1 ejector	do	100	1	Springfield...	
	Ward-Burton, mod. 1870.	20	1 firing-pin	do	100	8	Springfield...	
Oct . . .	Remington, model 1870..	20	None reported	do	30		Springfield...	
	Springfield, model 1870..	17	do	do	30		Springfield...	
	Ward-Burton, mod. 1870.	20	do	do	30		Springfield...	
Nov . . .	Remington, model 1870..	20	do	do	50		Springfield...	
	Springfield, model 1870..	17	do	do	50		Springfield...	
	Ward-Burton, mod. 1870.	20	do	do	50	1	Springfield...	
1873.								
Feb . . .	Remington, model 1870..	20	do	do	40		Springfield...	
	Springfield, model 1870..	18	do	do	40		Springfield...	
	Ward-Burton, mod. 1870.	20	do	do	40		Springfield...	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	1 rear-sight.....	1,240	16
Springfield, model 1870.....	20	1 barrel, 1 ejector.....	1,726	14
Sharps, model 1870.....	20	1 lever-catch, 1 lever, 1 breech-block, 1 rear-sight, 1 bridle, 1 tumbler.....	860	20
Ward-Burton, model 1870.....	20	1 firing-pin.....	640	11

Company F, Fifth Infantry, Captain Simon Snyder commanding; Remington, Springfield, and Sharps rifle-muskets issued May 16, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
July...	Remington, model 1870...	20	None reported...	No remarks...	...	...	Springfield...	
	Springfield, model 1870...	20	do...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	do...	do...	...	...	Springfield...	
Aug...	Remington, model 1870...	20	do...	do...	...	...	Springfield...	
	Springfield, model 1870...	20	do...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	do...	do...	...	...	Springfield...	
Sept...	Remington, model 1870...	20	do...	do...	...	...	Springfield...	
	Springfield, model 1870...	20	do...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	do...	do...	...	...	Springfield...	
Oct...	Remington, model 1870...	18	1 stock...	do...	...	...	Springfield...	
	Springfield, model 1870...	20	None reported...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	1 barrel burst...	do...	...	...	Springfield...	
Nov...	Remington, model 1870...	18	None reported...	do...	...	...	Springfield...	
	Springfield, model 1870...	20	do...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	1 barrel burst and 1 stock broken...	do...	...	...	Springfield...	
Dec...	Remington, model 1870...	18	None reported...	do...	...	...	Springfield...	
	Springfield, model 1870...	20	do...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	do...	do...	...	...	Springfield...	
1872.								
Jan...	Remington, model 1870...	18	do...	do...	...	...	Springfield...	
	Springfield, model 1870...	20	do...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	do...	do...	...	...	Springfield...	
March...	Remington, model 1870...	18	do...	do...	...	...	Springfield...	
	Springfield, model 1870...	20	do...	do...	...	...	Springfield...	
	Sharps, model 1870...	20	do...	do...	...	...	Springfield...	

Company F, Fifth Infantry, Captain Simon Snyder commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
April ..	Remington, model 1870..	17	None reported.....	No remarks.....	.....	.....	Springfield...	
	Springfield, model 1870..	20	do	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	20	do	do .....	.....	.....	Springfield...	
May ...	Remington, model 1870..	17	do	do .....	.....	.....	Springfield...	
	Springfield, model 1870..	20	2 firing-pins.....	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	20	1 stock-screw	do .....	.....	.....	Springfield...	
June...	Remington, model 1870..	17	None reported	do .....	.....	.....	Springfield...	
	Springfield, model 1870..	20	do	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	20	do	do .....	.....	.....	Springfield...	
July ...	Remington, model 1870..	17	1 lock, accidentally	do .....	.....	.....	Springfield...	
	Springfield, model 1870..	20	2 firing-pins, 2 firing-pin springs, 2 ejector-springs.	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	20	None reported.....	do .....	.....	.....	Springfield...	
Aug ...	Remington, model 1870..	17	1 stock.....	do .....	.....	.....	Springfield...	
	Springfield, model 1870..	20	None reported.....	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	20	do	do .....	.....	.....	Springfield...	
Sept ...	Remington, model 1870..	17	1 stock, 1 firing-pin.....	do .....	.....	.....	Springfield...	
	Springfield, model 1870..	20	2 firing-pins, 2 firing-pin springs, 2 band-swivel screws.	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	20	None reported	do .....	.....	.....	Springfield...	
TOTALS.								
Broken parts belonging to the system.								
Kind of arms.			Orig- inally issued.					
Remington, model 1870.....			20	2 stocks, 1 lock, 1 firing-pin.....				
Springfield, model 1870.....			20	6 firing-pins, 4 firing-pin springs, 2 ejector-springs, 2 band-swivel screws.....				
Sharps, model 1870			20	2 barrels, 1 stock, 1 stock-screw				
Ward-Burton, model 1870			20	None reported				

Company G, Fifth Infantry, Captain Samuel Overshine commanding; Remington, Springfield, and Sharps rifle-muskets issued May 23, 1871; Ward-Burton rifle-muskets issued March 16, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges issued.	Preference.	Remarks.
1871. June...	Remington, model 1870...	18	None reported	To load at half-cock; guard-swivel in the way; ramrod too short.	.....	.....	.....	.....
	Springfield, model 1870...	18	do	No remarks.	.....	.....	Springfield...	.....
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	.....	.....	.....	.....
July ...	Remington, model 1870...	18	do	To load at half-cock; guard-swivel in the way; ramrod too short.	278	.....	.....	.....
	Springfield, model 1870...	18	do	No remarks.	225	.....	Springfield...	{ All the arms too hard on trigger.
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	310	.....	.....	.....
Aug ...	Remington, model 1870...	18	do	To load at half-cock; guard-swivel in the way; ramrod too short.	360	.....	.....	.....
	Springfield, model 1870...	18	do	No remarks.	240	.....	Springfield...	.....
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	180	.....	.....	.....
Sept ...	Remington, model 1870...	18	do	To load at half-cock; guard-swivel in the way; ramrod too short.	200	.....	.....	.....
	Springfield, model 1870...	18	do	No remarks.	100	.....	Springfield...	.....
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	100	.....	.....	.....
Oct	Remington, model 1870...	18	do	To load at half-cock; guard-swivel in the way; ramrod too short.	180	.....	.....	.....
	Springfield, model 1870...	18	do	No remarks.	100	.....	Springfield...	.....
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	100	.....	.....	.....
Nov . {	Remington, model 1870...	18	do	To load at half-cock; guard-swivel in the way; ramrod too short.	.....	.....	.....	.....
Dec.. {	Springfield, model 1870...	18	do	No remarks.	.....	.....	Springfield...	.....
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	.....	.....	.....	.....
1872. Jan	Remington, model 1870...	18	1 tang-screw	To load at half-cock; guard-swivel in the way; ramrod too short.	49	.....	.....	.....
	Springfield, model 1870...	18	None reported	No remarks.	50	.....	Springfield...	.....
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	54	.....	.....	.....
Feb.....	Remington, model 1870...	18	do	To load at half-cock; guard-swivel in the way; ramrod too short.	.....	.....	.....	.....
	Springfield, model 1870...	18	do	No remarks.	.....	.....	Springfield...	.....
	Sharps, model 1870...	18	do	Guard-swivel in the way; ramrod too short; cartridge-shells stick.	.....	.....	.....	.....

Company G, Fifth Infantry, Captain Samuel Overshine commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
Mar..	Remington, model 1870..	18	None reported	To load at half-cock; guard-swivel in the way; ramrod too short.	.....	.....	Springfield...	
April	Springfield, model 1870..	18	do	No remarks.....	.....	.....	Springfield...	
May .	Ward-Burton, model 1870..	18	do	Too complicated; liable to premature discharge.	.....	.....	Springfield...	
June...	Remington, model 1870..	17	1 ejector	To load at half-cock; guard-swivel in the way; ramrod too short.	51	.....	Springfield...	
	Springfield, model 1870..	18	None reported	No remarks.....	72	.....	Springfield...	
	Ward-Burton, model 1870..	18	do	Self-cocking arrangement objectionable..	54	.....	Springfield...	
July...	Remington, model 1870..	16	do	To load at half-cock; guard-swivel in the way; ramrod too short.	54	.....	Springfield...	
	Springfield, model 1870..	18	do	No remarks.....	80	.....	Springfield...	
	Ward-Burton, model 1870..	18	do	Too complicated; liable to premature discharge.	54	.....	Springfield...	
Aug...	Remington, model 1870..	16	do	To load at half-cock; guard-swivel in the way; ramrod too short.	112	.....	Springfield...	{ Rear-sight slides become loose from wear.
	Springfield, model 1870..	18	do	No remarks.....	132	.....	Springfield...	
Sept...	Ward-Burton, model 1870..	18	1 breech-bolt cracked.....	Self-cocking arrangement objectionable..	48	.....	.....	
	Remington, model 1870..	16	None reported	To load at half-cock; guard-swivel in the way; ramrod too short.	52	.....	.....	
	Springfield, model 1870..	18	do	No remarks.....	48	.....	.....	
	Ward-Burton, model 1870..	18	do	Self-cocking arrangement objectionable..	96	.....	.....	
Oct....	Remington, model 1870..	16	do	To load at half-cock; guard-swivel in the way; ramrod too short.	.....	.....	Springfield...	
	Springfield, model 1870..	18	do	No remarks.....	.....	.....	.....	
	Ward-Burton, model 1870..	18	do	Self-cocking arrangement objectionable..	.....	.....	.....	
Nov...	Remington, model 1870..	16	do	To load at half-cock; guard-swivel in the way; ramrod too short.	32	.....	Springfield...	
	Springfield, model 1870..	18	do	No remarks.....	28	.....	Springfield...	
	Ward-Burton, model 1870..	18	1 mainspring.....	Self-cocking arrangement objectionable..	28	.....	.....	
Dec....	Remington, model 1870..	16	1 firing-pin.....	To load at half-cock; guard-swivel in the way; ramrod too short.	25	.....	Springfield...	
	Springfield, model 1870..	18	None reported	No remarks.....	40	.....	.....	
	Ward-Burton, model 1870..	18	do	Self-cocking arrangement objectionable..	20	.....	.....	
f 1873.								
Jan....	Remington, model 1870..	16	do	No remarks.....	.....	.....	Springfield...	
	Springfield, model 1870..	18	do	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	17	do	do .....	.....	.....	Springfield...	
Feb....	Remington, model 1870..	16	do	do .....	.....	.....	Springfield...	
	Springfield, model 1870..	18	do	do .....	.....	.....	Springfield...	
	Ward-Burton, model 1870..	17	do	do .....	.....	.....	Springfield...	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	18	1 firing-pin, 1 tang-screw, 1 ejector.....	1,213	.....
Springfield, model 1870.....	18	None reported.....	1,115	.....
Sharps, model 1870.....	18	do.....	744	5
Ward-Burton, model 1870.....	18	1 breech-bolt, 1 mainspring.....	300	.....

Company H, Fifth Infantry, Lieutenant T. H. Logan commanding; Remington, Springfield, and Sharps rifle-muskets issued May 16, 1871; Ward-Burton rifle-muskets issued March 16, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
June...	Remington, model 1870..	18	1 firing-pin.....	No remarks.....	18	1	.....	
	Springfield, model 1870..	18	1 firing-pin, 1 tumbler-screw...	do.....	12	.....	.....	
	Sharps, model 1870.....	18	2 levers, 1 lever-spring.....	do.....	6	.....	.....	
July...	Remington, model 1870..	18	None reported.....	do.....	72	1	.....	
	Springfield, model 1870..	18	1 br'ch-bl'k cap-screw, 1 searspring	do.....	78	2	.....	
	Sharps, model 1870.....	18	None reported.....	do.....	50	1	.....	
Aug...	Remington, model 1870..	17	do.....	do.....	189	2	.....	
	Springfield, model 1870..	18	1 tumbler-screw, 1 firing-pin screw	do.....	275	4	.....	
	Sharps, model 1870.....	18	None reported.....	Lever is made of too hard metal.....	266	3	.....	
Sept...	Remington, model 1870..	17	do.....	No remarks.....	179	1	.....	
	Springfield, model 1870..	18	1 tumbler-screw, 1 firing-pin spring	do.....	158	3	Springfield...	
	Sharps, model 1870.....	18	None reported.....	Lever is made of too hard metal.....	208	2	.....	
Oct....	Remington, model 1870..	17	do.....	No remarks.....	50	.....	.....	
	Springfield, model 1870..	18	do.....	do.....	46	.....	Springfield...	
	Sharps, model 1870.....	18	do.....	Lever is made of too hard metal.....	54	.....	.....	
Nov...	Remington, model 1870..	17	do.....	No remarks.....	56	.....	.....	
	Springfield, model 1870..	18	do.....	do.....	62	1	Springfield...	
	Sharps, model 1870.....	18	do.....	Lever is made of too hard metal.....	32	1	.....	
Dec....	Remington, model 1870..	17	do.....	No remarks.....	170	1	.....	
	Springfield, model 1870..	17	do.....	do.....	155	2	Springfield...	{ Recommends the barrels of all arms be made heavier.
	Sharps, model 1870.....	18	do.....	Gun-sling swivel to be moved forward...	170	1	.....	
1872.								
Jan....	Remington, model 1870..	17	do.....	No remarks.....	145	1	.....	
	Springfield, model 1870..	17	do.....	do.....	180	1	Springfield...	
	Sharps, model 1870.....	18	do.....	Gun-sling swivel to be moved forward.....	155	1	.....	

Company H, Fifth Infantry, Lieutenant T. H. Logan commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
Feb....	Remington, model 1870..	17	None reported.	No remarks.	130	1	Springfield...	
	Springfield, model 1870..	17	do	do	200	2		
	Sharps, model 1870.....	18	do	Gun-sling swivel to be moved forward.	140	1		
March..	Remington, model 1870..	17	do	No remarks.	130	2		
	Springfield, model 1870..	17	do	do	260	1	Springfield...	
	Sharps, model 1870.....	2	2 tips of levers.	Gun-sling swivel to be moved forward.	115			
	Ward-Burton, model 1870..	18	None reported.	No remarks.				
April..	Remington, model 1870..	17	do	do	200			
	Springfield, model 1870..	17	do	do	230	2		
	Sharps, model 1870.....	2	do	Gun-sling swivel to be moved forward.			Springfield...	
	Ward-Burton, model 1870..	18	do	A dangerous weapon on account of liability of premature discharge.	70			
May...	Remington, model 1870..	17	do	No remarks.	150			
	Springfield, model 1870..	17	do	do	150			
	Sharps, model 1870.....	2	do	Gun-sling swivel to be moved forward.			Springfield...	
	Ward-Burton, model 1870..	18	do	A dangerous weapon on account of liability of premature discharge.	150	1		
June...	Remington, model 1870..	16	do	No remarks.	110	2		
	Springfield, model 1870..	17	do	do	220	3		
	Sharps, model 1870.....		do	Gun-sling swivel to be moved forward.			Springfield...	
	Ward-Burton, model 1870..	18	None reported.	A dangerous weapon on account of liability of premature discharge.	110	1		
July...	Remington, model 1870..	16	Bore torn and screws lost.	No remarks.	130	2		
	Springfield, model 1870..	17	None reported.	do	230	3	Springfield...	
	Sharps, model 1870.....		do	Gun-sling swivel to be moved forward.				
	Ward-Burton, model 1870..	18	1 breech-bolt.	A good arm in the hands of careful men.	160	2		
Aug...	Remington, model 1870..	15	1 rear-sight.	No remarks.	130	1		
	Springfield, model 1870..	17	None reported.	do	230	3	Springfield...	
	Sharps, model 1870.....		do	Gun-sling swivel to be moved forward.				
	Ward-Burton, model 1870..	17	1 rear-sight.	A good arm in the hands of careful men.	160	3		
Sept...	Remington, model 1870..	15	None reported.	No remarks.	160	2		
	Springfield, model 1870..	17	do	do	230	3	Springfield...	
	Sharps, model 1870.....		do	Gun-sling swivel to be moved forward.				
	Ward-Burton, model 1870..	17	None reported.	A good arm in the hands of careful men.	200	3		
Oct....	Remington, model 1870..	15	do	No remarks.	140	1		
	Springfield, model 1870..	17	do	do	180	3	Springfield...	
	Sharps, model 1870.....	15	do	Gun-sling swivel to be moved forward.				
	Ward-Burton, model 1870..	17	do	A good arm in the hands of careful men.	140	2		
Nov...	Remington, model 1870..	15	do	No remarks.	170	1		
	Springfield, model 1870..	15	do	do	190		Springfield...	
	Sharps, model 1870.....	5	do	Gun-sling swivel to be moved forward.				
	Ward-Burton, model 1870..	17	do	A good arm in the hands of careful men.	130			

Dec....	Remington, model 1870..	15	do.....	No remarks.....	39	.....	.....
	Springfield, model 1870..	20	3 firing-pins.....	do.....	100	1	Springfield...
	Sharps, model 1870	...	None reported.....	Gun-sling swivel to be moved forward.....	...	...	...
	Ward-Burton, model 1870	17	do.....	A good arm in the hands of careful men.....	50	...	...
1873.							
Jan...{	Remington, model 1870..	14	do.....	No remarks.....	...	...	Springfield...
Feb... }	Springfield, model 1870..	20	do.....	do.....	...	...	...
	Ward-Burton, model 1870	17	do.....	do.....	...	...	...

TOTALS.

Kind of arms.		Orig- inally issued.	Broken parts belonging to the system.				Car- tridges fired.	Car- tridges failed.
Remington, model 1870.....	18	1 firing-pin, 1 rear-sight.....					2,368	19
Springfield, model 1870.....	18	1 firing-pin screw, 1 firing-pin spring, 3 tumbler-screws, 4 firing-pins, 1 breech-block cap-screw, 1 scar spring.....					3,186	34
Sharps, model 1870.....	18	2 levers, 1 lever-spring.....					1,206	10
Ward-Burton, model 1870.....	18	1 breech-bolt, 1 rear-sight.....					1,170	12

Company I, Fifth Infantry, Captain W. Lyman commanding; Remington locking-rifles issued December 21, 1872.

Date of re- port.	Kind of arms.	Broken parts.		Modifications and improvements sug- gested.	Cartridges		Preference.	Remarks.
		On hand.	None reported.....		fired.	failed.		
	Remington, locking-rifles	60		No remarks.....				

Company K, Fifth Infantry, Captain D. H. Brotherton commanding; Remington, Springfield, and Sharps rifle-muskets issued May 16, 1871; Ward-Burton rifle-muskets issued March 16, 1872.

1871.	Remington, model 1870..	20	None reported.....	No remarks.....	24	2	Springfield...
My...	Springfield, model 1870..	20	do.....	do.....	27	...	...
	Sharps, model 1870	20	do.....	do.....	39	4	...
June...	Remington, model 1870..	20	do.....	do.....	57	4	Springfield...
	Springfield, model 1870..	20	do.....	do.....	75	4	...
	Sharps, model 1870	20	do.....	do.....	72	...	...
Aug...	Remington, model 1870..	20	do.....	do.....	60	...	...
	Springfield, model 1870..	20	do.....	do.....	74	...	Springfield...
	Sharps, model 1870	20	do.....	do.....	96	...	...

Company K, Fifth Infantry, Captain D. H. Brotherton commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Sept . . .	Remington, model 1870 . . .	20	None reported . . .	No remarks . . .	68	..	} Springfield . . .	
	Springfield, model 1870 . . .	20	do . . .	do . . .	93	..		
	Sharps, model 1870 . . .	20	do . . .	do . . .	95	..		
Oct . . .	Remington, model 1870 . . .	20	do . . .	do . . .	18	..	} Springfield . . .	
	Springfield, model 1870 . . .	20	do . . .	do . . .	33	..		
	Sharps, model 1870 . . .	20	do . . .	do . . .	24	..		
Nov . . .	Remington, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable . . .	..	..	} Springfield . . .	
	Springfield, model 1870 . . .	20	do . . .	No remarks . . .	..	..		
	Sharps, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable . . .	..	..		
Dec . . .	Remington, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable; to load at half-cock. . .	20	..	} Springfield . . .	{ Lieut. Mason commanding.
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .	18	..		
	Sharps, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable . . .	20	1		
1872.								
Jan . . .	Remington, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable; to load at half-cock. . .	27	..	} Springfield . . .	{ Lieut. Mason commanding.
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .	27	..		
	Sharps, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable . . .	30	..		
Feb . . .	Remington, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable; to load at half-cock. . .	..	..	} Springfield . . .	{ Lieut. Mason commanding.
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .	..	..		
	Sharps, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable . . .	..	..		
March . .	Remington, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable; to load at half-cock. . .	100	..	} Springfield . . .	{ Lieut. Mason commanding.
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .	100	..		
	Sharps, model 1870 . . .	1	Rear-sight and lever-catch lost . . .	Rear-sight slides unserviceable . . .	100	..		
April . .	Ward-Burton, model 1870 . . .	20	None reported . . .	No remarks . . .	..	..	} Springfield . . .	{ Lieut. Mason commanding.
	Remington, model 1870 . . .	20	do . . .	Rear-sight slides unserviceable; to load at half-cock. . .	..	..		
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .	..	..		
May . . .	Sharps, model 1870 . . .	19	do . . .	Rear-sight slides unserviceable . . .	..	..	} Springfield . . .	{ Lieut. Mason commanding.
	Ward-Burton, model 1870 . . .	20	do . . .	No remarks . . .	..	..		
	Remington, model 1870 . . .	20	do . . .	do . . .	..	..		
June . . .	Springfield, model 1870 . . .	19	do . . .	do . . .	..	..	} Springfield . . .	{ Lieut. Mason commanding.
	Ward-Burton, model 1870 . . .	20	do . . .	do . . .	120	1		
	Remington, model 1870 . . .	20	do . . .	do . . .	180	1		
Sept . . .	Springfield, model 1870 . . .	19	do . . .	do . . .	100	1	} Springfield . . .	{ Lieut. Mason commanding.
	Ward-Burton, model 1870 . . .	20	do . . .	do . . .	81	..		
	Remington, model 1870 . . .	20	do . . .	To load at half-cock . . .	102	..		
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .	117	..	} Springfield . . .	{ Lieut. Mason commanding.
	Ward-Burton, model 1870 . . .	20	do . . .	do . . .	..	..		
	Remington, model 1870 . . .	20	do . . .	do . . .	..	..		

Nov ...	Remington, model 1870...	20	do	To load at half-cock...	Springfield...	{	Lieut. Mason Carter,
1873,	Springfield, model 1870...	19	do	No remarks...	do	{	commanding.
Jan ...	Ward-Burton, model 1870	20	do	do	do	{	
Feb...	Remington, model 1870...	10	do	do	do	{	
March	Springfield, model 1870...	28	do	do	do	{	
	Ward-Burton, model 1870	20	do	do	do	{	
	Remington, model 1870...	10	do	do	do	{	
	Springfield, model 1870...	28	do	do	do	{	
	Ward-Burton, model 1870...	10	do	do	do	{	
	Remington, model 1870...	28	do	do	do	{	
	Springfield, model 1870...	20	do	do	do	{	
	Ward-Burton, model 1870	20	do	do	do	{	
TOTALS.							
Kind of arms.				Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870				20		576	7
Springfield, model 1870				20		729	1
Sharps, model 1870				20		476	9
Ward-Burton, model 1870				20		217	1

Company B, Sixth Infantry, Captain Orlando H. Moore commanding; Remington, Springfield, and Sharps rifle-muskets issued May 18, 1871.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
July	Remington, model 1870..	18	None reported	To load at half-cock.	.....	.....	.....	.....
	Springfield, model 1870..	18	do	No remarks.	.....	.....	.....	.....
	Sharps, model 1870	18	do	do	.....	.....	.....	.....
Aug	Remington, model 1870..	18	do	To load at half-cock.	36	.....	.....	.....
	Springfield, model 1870	18	do	No remarks.	36	.....	.....	.....
	Sharps, model 1870	18	1 rear-sight	do	36	.....	.....	.....
Sept	Remington, model 1870..	18	None reported	To load at half-cock	70	.....	.....	.....
	Springfield, model 1870..	18	do	No remarks.	60	.....	.....	.....
	Sharps, model 1870	18	do	do	70	.....	.....	.....
Oct	Remington, model 1870..	18	1 rear-sight	To load at half-cock	.....	.....	.....	.....
	Springfield, model 1870..	17	1 musket complete, lost	No remarks	.....	.....	.....	.....
	Sharps, model 1870	18	1 stock	do	.....	.....	.....	.....
Nov	Remington, model 1870..	18	None reported	To load at half-cock	50	.....	.....	.....
	Springfield, model 1870..	17	do	No remarks	50	.....	.....	.....
	Sharps, model 1870	20	1 stock, 1 rear-sight	do	50	.....	.....	.....

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	18	1 rear-sight, 1 tip-stock.....	681	.....
Springfield, model 1870.....	18	None reported.....	669	.....
Sharps, model 1870.....	18	8 stocks, 4 rear-sights, 1 barrel bent.....	681	.....

Company F, Sixth Infantry, Captain W. W. Sanders commanding; Remington, Springfield, and Sharps rifle-muskets issued May 18, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870 ..	18	None reported ..	No remarks.....	70	14	.....	
	Springfield, model 1870 ..	18	do ..	do ..	60	10	.....	
	Sharps, model 1870 ..	18	do ..	do ..	63	9	.....	
July...	Remington, model 1870 ..	18	do ..	Should be modified to load at half-cock.....	28	3	.....	
	Springfield, model 1870 ..	18	1 rear-sight leaf.....	No remarks.....	28	5	.....	
	Sharps, model 1870 ..	18	None reported ..	do ..	28	2	.....	
Aug...	Remington, model 1870 ..	18	do ..	Should be modified to load at half-cock.....	27	3	.....	
	Springfield, model 1870 ..	18	do ..	No remarks.....	27	1	.....	
	Sharps, model 1870 ..	18	do ..	do ..	27	1	.....	
Nov...	Remington, model 1870 ..	17	do ..	Should be modified to load at half-cock.....	132	1	Remington...	
	Springfield, model 1870 ..	16	do ..	No remarks.....	131	18	.....	
	Sharps, model 1870 ..	16	1 lever.....	do ..	118	3	.....	
Dec...	Remington, model 1870 ..	17	None reported ..	Should be modified to load at half-cock.....	30	.....	Remington...	{ Lieutenant R. H. Day commanding.
	Springfield, model 1870 ..	17	do ..	No remarks.....	40	.....	.....	
	Sharps, model 1870 ..	16	1 lever-spring.....	do ..	30	1	.....	
1872. March...	Remington, model 1870 ..	14	1 stock, 1 rear-sight leaf, 1 guard-swivel.....	Should be modified to load at half-cock.....	400	7	Remington...	{ Lieutenant R. H. Day commanding.
	Springfield, model 1870 ..	17	1 rear-sight leaf.....	No remarks.....	330	5	.....	
	Sharps, model 1870 ..	17	1 lever, 1 tumbler ..	do ..	300	11	.....	
May...	Remington, model 1870 ..	13	None reported ..	To load at half-cock; to have ejector-spring in barrel.	.....	.....	Remington, with suggested modifications.	{ Lieutenant R. H. Day commanding.
	Springfield, model 1870 ..	16	do ..	No remarks.....	.....	.....	.....	
	Sharps, model 1870 ..	16	1 tip-stock, 1 band, 1 sear.....	do ..	.....	.....	.....	
	Ward-Burton, model 1870 ..	18	None reported ..	do ..	.....	.....	.....	

Company F, Sixth Infantry, Captain W. W. Sanders commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. June...	Remington, model 1870 .. Springfield, model 1870 ..	13 16	None reported .. do ..	To load at half-cock; to have ejector-spring in barrel. No remarks ..	.....	.....	.....	Lieutenant R. H. Day commanding.
Aug ...	Sharps, model 1870 .. Ward-Burton, model 870 .. Remington, model 1870 .. Springfield, model 1870 .. Ward-Burton, model 1870 ..	16 18 13 30 18	do .. do .. do .. do .. do ..	do .. do .. To load at half-cock; to have ejector-spring in barrel. No remarks .. do ..	 986	 18	Remington... Remington...	Lieutenant R. H. Day commanding. Lieutenant R. H. Day commanding.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870 .. Springfield, model 1870 .. Sharps, model 1870 .. Ward-Burton, model 1870 ..	18 18 18 18	1 stock, 1 rear-sight leaf, 1 guard-swivel .. 2 rear-sight leaves .. 1 tip-stock, 1 band, 1 sear, 2 levers, 1 lever-spring, 1 tumbler	687 616 566	38 39 27

Company G, Sixth Infantry, Captain H. S. Hawkins commanding; Remington, Springfield, and Sharps rifle-muskets issued May 18, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. July...	Remington, model 1870 .. Springfield, model 1870 .. Sharps, model 1870 ..	20 20 20	None reported .. do .. do ..	Should load at half-cock; cartridge-shells stick. No remarks .. Falls to eject shells ..	90 84 70	5 3 2	Springfield...	

Aug...	Remington, model 1870 ..	20	do	Should load at half-cock; cartridge-shells stick.	136	5	Springfield...
	Springfield, model 1870 ..	20	do	No remarks	138	4	
	Sharps, model 1870	20	do	Fails to eject shells	136		
Sept...	Remington, model 1870 ..	20	do	Should load at half-cock; cartridge-shells stick.	145	6	
	Springfield, model 1870 ..	20	do	No remarks	139	5	Springfield...
	Sharps, model 1870	20	1 tumbler	Fails to eject shells	126	7	
Dec....	Remington, model 1870 ..	20	None reported	Should load at half-cock; cartridge-shells stick.	215	6	
	Springfield, model 1870 ..	20	do	No remarks	215	3	Springfield...
	Sharps, model 1870	18	1 lost, 1 stock, 1 tang, 1 escutcheon	Fails to eject shells	215	4	
1872.	Remington, model 1870 ..	16	None reported	No remarks	256	10	
June...	Springfield, model 1870 ..	20	do	do	300	15	Springfield...
	Ward-Burton, model 1870 ..	20	1 breech-bolt	The shoulder of ejector to be made wider.	265	12	

TOTALS.

Kind of arms.		Orig- nally issued.	Broken parts belonging to the system.		Cartridges fired.	Car- tridges failed.
Remington, model 1870 ..		20	None reported		841	32
Springfield, model 1870 ..		20	do		876	30
Sharps, model 1870		20	1 stock, 1 escutcheon, 1 tumbler, 1 tang		547	13
Ward-Burton, model 1870 ..		20	1 breech-bolt		265	12

Company A, Eighth Infantry, Captain G. M. Brayton commanding; Remington locking-rifles issued November 7, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
Nov...	Remington locking-rifles.	58	Broken in transportation	Have not been tested				
Dec....	do	58	None reported	Most durable and most unlikely to get out of order. The ejection fails in many instances to throw the shell out entirely; this can be remedied by lengthening the thumb-piece of the breech-block.	480	29		
1873.								
Jan....	do	58	do	Should have two ejectors, one on each side.	354	18	Remington locking-rifle.	
Feb....	do	58	do	do	366	8	Remington locking-rifle.	

Company A, Eighth Infantry, Captain G. M. Brayton commanding—Continued.

TOTALS.

Kind of arms.		Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington locking-rifles.....					1,200	55

Company I, Eighth Infantry, Captain Alfred Z. Smith commanding; Remington locking-rifles issued November 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Dec....	Remington locking-rifles.	58	None reported	Sometimes fails to eject cartridge-shell...	494	40	Remington locking-rifle.	
1873. Jan....	do	58	Small of stock broken	Guard-plate should be extended so as to strengthen small of stock.	450	33	Remington locking-rifle.	
Feb....	do	58	None reported	do	477	52	Remington locking-rifle.	

TOTALS.

Kind of arms.		Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington locking-rifles.....		58	.....		1,421	125

Company B, Ninth Infantry, Captain J. D. Devin commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. May....	Remington, model 1870...	20	1 swivel.....	To load at half-cock; enlarge guard-swivel; comb of hammer too short.	60	.....		

June...	Springfield, model 1870..	20	None reported	No remarks.	60	.....	Springfield...
	Sharps, model 1870	20	do	Very awkward arm; sling in the way; lever catch an impediment in drilling.	60	.....	
	Remington, model 1870..	20	1 guard-swivel	To load at half-cock; enlarge guard-swivel; comb of hammer too short.	150	.....	
July...	Springfield, model 1870..	20	None reported	No remarks.	150	.....	Springfield...
	Sharps, model 1870	20	do	Very awkward arm; sling in the way; lever-catch an impediment in drilling.	150	.....	
	Remington, model 1870..	20	do	To load at half-cock; enlarge guard-swivel; comb of hammer too short.	200	.....	
Aug...	Springfield, model 1870..	20	do	No remarks.	200	.....	Springfield...
	Sharps, model 1870	20	do	Very awkward arm; sling in the way; lever-catch an impediment in drilling.	200	.....	
	Remington, model 1870..	18	1 guard-swivel, 2 rear-sights.	To load at half-cock; enlarge guard-swivel; comb of hammer too short.	350	12	
Nov...	Springfield, model 1870..	19	None reported	No remarks.	225	2	Springfield...
	Sharps, model 1870	20	do	Very awkward arm; sling in the way; lever-catch an impediment in drilling.	275	6	
	Remington, model 1870..	17	1 barrel burst	Dust and rust prevent hammer from working freely.	500	15	
Dec....	Springfield, model 1870..	17	do	No remarks.	500	8	Springfield...
	Sharps, model 1870	20	1 stock	Breech-block works stiffly after firing.	100	2	
	Remington, model 1870..	14	None reported	Dust and rust prevent hammer from working freely.	300		
1872.	Springfield, model 1870..	15	do	No remarks.	500	3	Springfield...
	Sharps, model 1870	16	do	Breech-block works stiffly after firing.	500	6	
	Remington, model 1870..	13	do	Dust and rust prevent hammer from working freely.	300	1	
Jan....	Springfield, model 1870..	23	do	No remarks.	200	1	Springfield...
	Sharps, model 1870	16	do	Breech-block works stiffly after firing.	200	2	
	Remington, model 1870..	13	do	Dust and rust prevent hammer from working freely.	200	3	
Feb....	Springfield, model 1870..	23	do	No remarks.	100	.....	Springfield...
	Sharps, model 1870	16	do	Breech-block works stiffly after firing.	100	1	
	Remington, model 1870..	13	do	Dust and rust prevent hammer from working freely.	200	2	
March..	Springfield, model 1870..	23	do	No remarks.	200	1	Springfield...
	Sharps, model 1870	16	do	Breech-block works stiffly after firing.	800	6	
	Remington, model 1870..	11	None reported	Dust and rust prevent hammer from working freely.	400	3	
April..	Springfield, model 1870..	20	do	No remarks.	400	4	Springfield...
	Ward-Burton, model 1870	20	1 breech-bolt	Too hard on trigger; breech-bolt not strong enough.	700	6	
	Remington, model 1870..	11	do	Dust and rust prevent hammer from working freely.	300	2	
May...	Springfield, model 1870..	20	do	No remarks.	300	3	Springfield...
	Ward-Burton, model 1870	20	do	Too hard on trigger; breech-bolt not strong enough.	400	3	
	Remington, model 1870..	11	do	Dust and rust prevent hammer from working freely.	300	2	

Company B, Ninth Infantry, Captain J. D. Devin commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872 June...	Remington, model 1870...	11	None reported	Dust and rust prevent hammer from work- ing freely.	300	2		
	Springfield, model 1870...	20	do	No remarks	200	1	Springfield..	
	Ward-Burton, model 1870	20	do	Too hard on trigger; breech-bolt not strong enough.	400	3		
July...	Remington, model 1870...	11	do	Dust and rust prevent hammer from work- ing freely.	240	3		
	Springfield, model 1870...	20	do	No remarks	130	2	Springfield..	
	Ward-Burton, model 1870	20	do	Too hard on trigger; breech-bolt not strong enough.	400	5		
Aug...	Remington, model 1870...	11	do	Dust and rust prevent hammer from work- ing freely.	300	3		
	Springfield, model 1870...	20	1 barrel bent	No remarks	200	2	Springfield..	
	Ward-Burton, model 1870	20	1 breech-bolt	Too hard on trigger; breech-bolt not strong enough.	300	2		
Sept...	Remington, model 1870...	11	None reported	Dust and rust prevent hammer from work- ing freely.	200	2		
	Springfield, model 1870...	20	do	No remarks	200	1	Springfield..	
	Ward-Burton, model 1870	20	1 stock	Too hard on trigger; breech-bolt not strong enough.	180	2		
Oct....	Remington, model 1870...	11	None reported	Dust and rust prevent hammer from work- ing freely.	150	2		
	Springfield, model 1870...	20	do	No remarks	150	1	Springfield..	
	Ward-Burton, model 1870	20	do	Mainspring becomes too weak after use...	200	16		
Dec....	Remington, model 1870...	10	do	Dust and rust prevent hammer from work- ing freely.	100	1	Springfield..	
	Springfield, model 1870...	19	do	No remarks	200	2		
	Ward-Burton, model 1870	18	do	Mainspring becomes too weak after use...	200	6		
1873 Jan....	Remington, model 1870...	8	do	To load at half-cock; hammer to project forward more.	100	1		
	Springfield, model 1870...	32	do	No remarks	300	2	Springfield..	
	Ward-Burton, model 1870	17	do	Breech-bolt not strong enough; too hard on trigger; mainspring too weak.	100	3		
Feb....	Remington, model 1870...	8	do	To load at half-cock; hammer to project forward more.	50	.....		
	Springfield, model 1870...	32	do	No remarks	300	2	Springfield..	
	Ward-Burton, model 1870	17	do	Breech-bolt not strong enough; too hard on trigger; mainspring too weak.	100	2		

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	3 guard-swivels, 2 rear-sights, 1 barrel	4,400	55
Springfield, model 1870.....	20	2 barrels	4,515	34
Sharps, model 1870	20	1 stock	1,585	17
Ward-Burton, model 1870	20	1 stock, 2 breech-bolts	3,780	54

Company C, Ninth Infantry, Captain S. Munson commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
May . . . {	Remington, model 1870 ..	20	None reported	No remarks	300	.....	.....	
June . . . }	Springfield, model 1870 ..	48	do	do .....	.....	.....	.....	
	Sharps, model 1870	20	do	do .....	.....	.....	.....	
July . . .	Remington, model 1870 ..	19	6 rear-sights	do	300	.....	.....	
	Springfield, model 1870 ..	47	None reported	do .....	.....	.....	.....	
	Sharps, model 1870	19	1 stock	do .....	.....	.....	.....	
Aug . . .	Remington, model 1870 ..	19	None reported	do	300	.....	.....	
	Springfield, model 1870 ..	47	do	do	300	.....	.....	
	Sharps, model 1870	19	do	do	300	.....	.....	
Sept . . .	Remington, model 1870 ..	19	do	do .....	.....	.....	.....	
	Springfield, model 1870 ..	47	do	do	900	.....	.....	
	Sharps, model 1870	19	do	do .....	.....	.....	.....	
Oct . . .	Remington, model 1870 ..	18	1 burnt	do	800	.....	.....	
	Springfield, model 1870 ..	46	2 burnt	do .....	.....	.....	.....	
	Sharps, model 1870	18	do	do .....	.....	.....	.....	
Nov . . .	Remington, model 1870 ..	18	None reported	do	900	.....	.....	
	Springfield, model 1870 ..	46	do	do .....	.....	.....	.....	
	Sharps, model 1870	18	do	do .....	.....	.....	.....	
Dec . . .	Remington, model 1870 ..	18	1 burnt	do .....	.....	.....	.....	
	Springfield, model 1870 ..	46	2 burnt	do	900	.....	.....	
	Sharps, model 1870	18	do	do .....	.....	.....	.....	
1872.								
Jan . . .	Remington, model 1870 ..	10	None reported	do .....	.....	.....	.....	
	Springfield, model 1870 ..	41	1 firing-pin spring	do .....	.....	.....	.....	
	Sharps, model 1870	14	1 band-spring	do .....	.....	.....	.....	

Company C, Ninth Infantry, Captain S. Munson commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. May ...	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870...	10 38 19	None reported do do	No remarks. do Inferior to either Remington or Springfield				
June...	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870...	9 39 19	do do do	No remarks. do Inferior to either Remington or Springfield				

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870..... Springfield, model 1870..... Sharps, model 1870..... Ward-Burton, model 1870.....	20 48 20 19	6 rear-sights..... 1 firing-pin spring..... 1 stock, 1 band-spring..... None reported.....	300 2, 100 300	..... ..... ..... .....

Company E, Ninth Infantry, Captain Edwin Pollock commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. July ...	Remington, model 1870... Springfield, model 1870... Sharps, model 1870.....	20 20 20	None reported 1 barrel burst..... 1 butt-stock.....	Lengthen cleaning-rod..... No remarks..... Lengthen cleaning-rod; change lower swivel.	24 51 18	..... ..... .....	..... } Springfield....	

Aug ...	Remington, model 1870...	20	None reported	No remarks	9	Springfield...
	Springfield, model 1870...	20	do	do	54	do
	Sharps, model 1870...	20	do	do	27	do
Oct ...	Remington, model 1870...	20	do	do	15	Springfield...
	Springfield, model 1870...	20	do	do	30	do
	Sharps, model 1870...	20	do	do	21	do
1872.						
Sept ...	Remington, model 1870...	20	do	Suggests withdrawal of Remington and Ward-Burton arms.	300	Springfield...
	Springfield, model 1870...	36	do	No remarks	200	do
	Ward-Burton, model 1870...	20	do	do	200	do
Dec....	Remington, model 1870...	20	do	Suggests withdrawal of Remington and Ward-Burton arms.	160	Springfield...
	Springfield, model 1870...	36	do	No remarks	350	do
	Ward-Burton, model 1870...	20	do	do	200	do

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870...	20	None reported		508	85
Springfield, model 1870...	20	1 barrel burst		731	30
Sharps, model 1870...	20	1 butt-stock		66	.....
Ward-Burton, model 1870...	20	None reported		400	80

Company D, Ninth Infantry, Captain P. A. Owen commanding ; Sharps rifle-muskets issued April 24, 1872.

Date of report	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873.								
Jan	Springfield, model 1870...	48	2 rear-sights	No remarks	321	.....	Springfield	
	Sharps, model 1870...	14	1 lever-key	do	90	.....		

Company G, Ninth Infantry, Captain T. B. Burrowes commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Sept . . .	Remington, model 1870 . . .	20	None reported	Loading at full cock is an insuperable objection.	210	5		
	Springfield, model 1870 . . .	20	do	To have elongated bright-metal front- sight and double ejector-spring.	210	3	Springfield . . .	{ Springfield far superior in accurate shooting qualities.
	Sharps, model 1870	20	do	Unwieldy; gun-sling in the way	200	3		
Nov . . .	Remington, model 1870 . . .	19	do	Dangerous in the hands of troops with double-rank formation.	125	7		
	Springfield, model 1870 . . .	20	do	To have elongated bright-metal front- sight and double ejector-spring.	125		Springfield . . .	
	Sharps, model 1870	20	do	Breech-block easily affected by changes of temperature.	125			
1872. Feb . . .	Remington, model 1870 . . .	19	do	To be made to load at half-cock; more efficient extractor.	900	6		{ Substitute a swell for shoulder on ramrods. Encircle muzzle of barrels with ring of steel.
	Springfield, model 1870 . . .	19	do	To have elongated bright-metal front- sight and double ejector-spring.	500	1	Springfield . . .	
March . .	Sharps, model 1870	20	do	Move lower swivel forward	700	3		
	Remington, model 1870 . . .	19	do	To be made to load at half-cock; more efficient extractor.				
	Springfield, model 1870 . . .	19	do	To have elongated bright-metal front- sight and double ejector-spring.			Springfield . . .	
	Ward-Burton, model 1870 . . .	20	do	Alter the extractor; "hook" too sharp; too hard on trigger.	600	3		
May . . .	Remington, model 1870 . . .	18	do	To be made to load at half-cock; more efficient extractor.	300			
	Springfield, model 1870 . . .	19	do	To have elongated bright-metal front- sight and double ejector-spring.	400		Springfield . . .	
	Ward-Burton, model 1870 . . .	20	do	Alter the extractor; "hook" too sharp; too hard on trigger.	300			
June . . .	Remington, model 1870 . . .	18	2 rear-sights	To be made to load at half-cock; more efficient extractor.	200			
	Springfield, model 1870 . . .	19	None reported	To have elongated bright-metal front- sight and double ejector-spring.	200		Springfield . . .	
	Ward-Burton, model 1870 . . .	20	1 breech-bolt, 3 trigger-stop screws	Too complicated; recoil very great	200			
Sept . . .	Remington, model 1870 . . .	17	None reported	To be made to load at half cock; more efficient extractor.	140			
	Springfield, model 1870 . . .	19	do	To have elongated bright-metal front- sight and double ejector-spring.	460	1	Springfield . . .	{ 1 Remington rendered unserviceable by body of cartridge sticking in bore.
	Ward-Burton, model 1870 . . .	20	do	Too complicated; recoil very great	200			

1873. Jan....	Remington, model 1870..	17	do	(Remington to load at half-cock, and longer firing-pin. For all arms substitute a swell for shoulder on ramrod. Encircle them with band of chilled steel for front-sight. Entire discontinuance of use as well as issue.	150	7	Springfield....	{ Lieutenant W. S. Wyatt commanding.
	Springfield, model 1870..	19	do		150			
	Ward-Burton, model 1870	20	do		100	3		

TOTALS.

Kind of arms.		Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870.....		20	2 rear-sights		2, 025	25
Springfield, model 1870.....		20	None reported		2, 045	5
Sharps, model 1870.....		20	do		1, 025	6
Ward-Burton, model 1870.....		20	1 breech-bolt, 3 trigger-stop screws		1, 400	6

Company A, Tenth Infantry, Captain F. E. Lacey commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of receipt.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Aug ...	Remington, model 1870..	20	None reported	To load at half-cock	20			
	Springfield, model 1870..	20	do	No remarks	20		Springfield...	
	Sharps, model 1870	20	do	Mechanism too much exposed to sand and rust: attachment of gun-sling awkward.	20			
				No remarks				
Sept ...	Remington, model 1870..	20	do	do			Springfield...	
	Springfield, model 1870..	20	do	do				
	Sharps, model 1870	20	do	do				
				do	24			
Oct ...	Remington, model 1870..	20	do	do	24		Springfield...	
	Springfield, model 1870..	20	do	do	24			
	Sharps, model 1870	20	do	do	24			
				Would consider it an advantage to be permitted to turn in the Sharps.				
Nov ...	Remington, model 1870..	20	do	No remarks	40			
	Springfield, model 1870..	20	do	do	40		Springfield...	
	Sharps, model 1870	20	do	Would consider it an advantage to be permitted to turn in the Sharps.	40			

Company A, Tenth Infantry, Captain F. E. Lacey commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Dec. 1871.	Remington, model 1870.	20	None reported.	No remarks.	.....	.....	Springfield.	
Jan. 1872.	Springfield, model 1870.	20	do.	Would consider it an advantage to be permitted to turn in the Sharps.	.....	.....	Springfield.	
Feb.	Sharps, model 1870.	20	do.	No remarks.	46	.....	Springfield.	
	Remington, model 1870.	20	do.	Would consider it an advantage to be permitted to turn in the Sharps.	46	8	Springfield.	
	Springfield, model 1870.	20	do.	No remarks.	48	.....	Springfield.	
March.	Remington, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
	Springfield, model 1870.	19	do.	Would consider it an advantage to be permitted to turn in the Sharps.	.....	.....	Springfield.	
	Sharps, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
April.	Remington, model 1870.	19	do.	No remarks.	50	8	Springfield.	
	Springfield, model 1870.	19	do.	Would consider it an advantage to be permitted to turn in the Sharps.	50	5	Springfield.	
	Sharps, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
May.	Remington, model 1870.	19	do.	No remarks.	.....	.....	Springfield.	
	Springfield, model 1870.	19	do.	Would consider it an advantage to be permitted to turn in the Sharps.	.....	.....	Springfield.	
	Sharps, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
June.	Remington, model 1870.	19	do.	No remarks.	30	2	Springfield.	{ Lieut. W. T. Duggan commanding.
	Springfield, model 1870.	18	do.	No remarks.	30	3	Springfield.	
	Sharps, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
	Ward-Burton, model 1870.	20	2 trigger-stop screws.	No remarks.	30	6	Springfield.	
July.	Remington, model 1870.	19	None reported.	No remarks.	.....	.....	Springfield.	
Aug.	Springfield, model 1870.	18	1 firing-pin.	No remarks.	.....	.....	Springfield.	
	Sharps, model 1870.	20	None reported.	No remarks.	.....	.....	Springfield.	
	Ward-Burton, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
Sept.	Remington, model 1870.	19	do.	No remarks.	.....	.....	Springfield.	
	Springfield, model 1870.	18	do.	No remarks.	.....	.....	Springfield.	
	Ward-Burton, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
Oct.	Remington, model 1870.	19	do.	No remarks.	.....	.....	Springfield.	
	Springfield, model 1870.	19	do.	No remarks.	20	3	Springfield.	
	Ward-Burton, model 1870.	19	do.	No remarks.	20	2	Springfield.	
Nov.	Remington, model 1870.	19	do.	No remarks.	.....	.....	Springfield.	
	Springfield, model 1870.	18	do.	No remarks.	.....	.....	Springfield.	
	Ward-Burton, model 1870.	20	do.	No remarks.	40	6	Springfield.	
Dec.	Remington, model 1870.	19	do.	No remarks.	.....	.....	Springfield.	
	Springfield, model 1870.	18	do.	No remarks.	.....	.....	Springfield.	
	Ward-Burton, model 1870.	20	do.	No remarks.	.....	.....	Springfield.	
1873.	Remington, model 1870.	19	do.	No remarks.	20	.....	Springfield.	
Jan.								

Feb....	Springfield, model 1870..	18	do	do	do	40	Springfield...
	Ward-Burton, model 1870	18	2 stocks	do	do	40	do
	Remington, model 1870..	19	1 stock	do	do	20	do
	Springfield, model 1870..	19	None reported	do	do	40	do
	Ward-Burton, model 1870	18	2 stocks	do	do	50	do

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TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870	20	1 stock		250	10
Springfield, model 1870	20	1 firing-pin		310	8
Sharps, model 1870	20	None reported		132	8
Ward-Burton, model 1870	20	4 stocks, 2 trigger-stop screws.		180	12

Company B, Tenth Infantry, Captain E. G. Bush commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Sept....	Remington, model 1870..	20	1 mainspring	Longer comb to hammer; to load at half-cock.	226	2		{ All arms should have rear-sights of the buckhorn pattern; hair-triggers an advantage.
	Springfield, model 1870..	20	None reported	No remarks	287			
	Sharps, model 1870	20	1 stock	Gun-sling in the way; lever shaped to fit the hand; breech-block made smaller.	226	21	Springfield...	
	Remington, model 1870..	20	None reported	Longer comb to hammer; to load at half-cock.	129			
Oct....	Springfield, model 1870..	20	do	No remarks	256			{
	Sharps, model 1870	19	1 firing-bolt	Gun-sling in the way; lever shaped to fit the hand; breech-block made smaller.	176		Springfield...	
	Remington, model 1870..	20	None reported	To have stronger ejector; should be locked when loaded; easier on trigger; trigger should not be used as sear.	120	3		
Nov...	Springfield, model 1870..	20	do	To have lock in small of stock, firing-pin in center of breech-block; easier on trigger.	109	2		
	Sharps, model 1870	19	do	To have lock in small of stock, firing-pin in center of breech-block; easier on trigger.	120	4	Springfield...	

Company B, Tenth Infantry, Captain E. G. Bush commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Dec....	Remington, model 1870..	20	None reported	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	79	1	Springfield....	{The men prefer the Springfield, as the manual is more easily executed and the re-coil less.
	Springfield, model 1870..	20	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	76	1		
	Sharps, model 1870.....	19	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	75	1		
1872. Jan....	Remington, model 1870..	20	do	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	42		Springfield....	
	Springfield, model 1870..	20	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	163	2		
	Sharps, model 1870.....	19	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	52	.....		
Feb....	Remington, model 1870..	20	do	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	84	1	Springfield....	
	Springfield, model 1870..	20	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	186	.....		
	Sharps, model 1870.....	19	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	55	2		
March.	Remington, model 1870..	20	do	Should be locked when loaded; easier on trigger; trigger should not be used as sear; to have stronger ejector.	20		Springfield....	
	Springfield, model 1870..	20	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	20	.....		
	Sharps, model 1870.....	19	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	3	.....		
April..	Remington, model 1870..	20	do	Should be locked when loaded; easier on trigger; trigger should not be used as sear; to have stronger ejector.	87	2	Springfield....	
	Springfield, model 1870..	19	do	To have lock in small of stock; firing-pin	144	.....		

May ...	Sharps, model 1870.....	19	do	in center of breech-block; easier on trigger. To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	103	.....	Springfield.	{ Lieut. C. S. Davis commanding.
	Remington, model 1870..	20	do	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	63	3		
	Springfield, model 1870..	19	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	111	1	Springfield.	{ Lieut. C. S. Davis commanding.
	Sharps, model 1870.....	19	1 mainspring, 1 sight.....	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	78	4		
	Remington, model 1870..	20	None reported	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	250	1		
June...	Springfield, model 1870..	19	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	370	.....	Springfield.	{ Lieut. C. S. Davis commanding.
	Sharps, model 1870.....	20	do	No remarks.....	192	.....		
	Ward-Burton, mod. 1870.	20	do	Firing-pin to be heavier and harder near point; easier on trigger.	219	17		
	Remington, model 1870..	20	do	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	48	1		
	Springfield, model 1870..	20	do	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	51	.....	Springfield.	{ Lieut. C. S. Davis commanding.
Aug ...	Ward-Burton, mod. 1870..	20	do	Firing-pin to be heavier and harder near the point; easier on trigger.	66	5		
	Remington, model 1870..	20	1 extractor.....	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	37	2		
	Springfield, model 1870..	20	2 extractor-springs, 2 cam-latch springs.	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	50	.....	Springfield.	{ Lieut. C. S. Davis commanding.
	Ward-Burton, mod. 1870.	20	1 mainspring, 2 firing-pins, 1 extractor, 1 locking-bolt spring.	Firing-pin to be heavier and harder near the point; easier on trigger.	183	18		
	Remington, model 1870..	20	2 butt-stocks, 3 rear-sight leaves.	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier when loaded.	21	.....		
Oct	Springfield, model 1870..	20	1 barrel burst.....	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	26	.....	Springfield.	{ Lieut. C. S. Davis commanding.
	Ward-Burton, mod. 1870.	20	1 guard-screw, 2 mainsprings.....	Firing-pin to be heavier and harder near the point; easier on trigger.	40	10		

Company B, Tenth Infantry, Captain E. G. Bush commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Nov . . .	Remington, model 1870..	20	1 stock broken; ramrod lost; barrel damaged.	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	27	1		
	Springfield, model 1870..	20	None reported	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	33	2	Springfield...	
	Ward-Burton, mod. 1870.	20	do	Too poor a system to be countenanced...	30	4		
Dec . . .	Remington, model 1870..	16	2 firing-pins, 2 firing-pin springs.	Trigger should not be used as sear; to have stronger ejector; should be locked when loaded; easier on trigger.	125	4		
	Springfield, model 1870..	19	2 breech-bolt cap-screws, 2 firing-pin springs.	To have lock in small of stock; firing-pin in center of breech-block; easier on trigger.	150	.....	Springfield...	
	Ward-Burton, mod. 1870.	18	1 ejector, 1 locking-bolt, 1 locking-bolt lever.	No remarks	125	11		
1873. Jan . . .	Remington, model 1870..	16	None reported	do	60	.....		
	Springfield, model 1870..	19	do	do	70	.....	Springfield...	
	Ward-Burton, mod. 1870.	18	1 trigger-stop screw.	do	70	.....		
Feb . . .	Remington, model 1870..	16	None reported	do	64	.....		
	Springfield, model 1870..	19	do	do	80	.....	Springfield...	
	Ward-Burton, mod. 1870.	18	do	Dangerous, because cocked by action of loading.	50	.....		
TOTALS.								
Kind of arms.			Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.	
Remington, model 1870.....			20	1 mainspring, 1 extractor, 3 butt-stocks, 2 firing-pins, 2 firing-pin springs, 3 rear-sight leaves, 1 ramrod, 1 barrel damaged.		1, 482	22	
Springfield, model 1870.....			20	2 ejector-springs, 2 cam-latch springs, 1 barrel, 2 breech-block cap-screws, 2 firing-pin springs...		2, 173	8	
Sharps, model 1870.....			20	1 firing-bolt, 1 mainspring, 1 sight.....		1, 080	32	
Ward-Burton, model 1870.....			20	3 mainsprings, 2 firing-pins, 1 guard-screw, 1 locking-bolt, 1 locking-bolt screw, 1 trigger-stop screw, 2 extractors, 1 locking-bolt spring.		783	65	

Company C, Tenth Infantry, Captain N. Prime commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Sept . . .	Remington, model 1870 . . .	18	None reported	To load at half-cock	800	9		
	Springfield, model 1870 . . .	18	do	No remarks	800	1	} Springfield . . .	
	Sharps, model 1870	19	do	Gun-sling in the way in handling . . .	800	14		
Nov . . .	Remington, model 1870 . . .	18	do	To load at half-cock	165	2		
	Springfield, model 1870 . . .	18	do	No remarks	155	1	} Springfield . . .	{ Lieut. D. H. Kelton commanding.
	Sharps, model 1870	19	do	Gun-sling in the way in handling . . .	150	3		
Dec. . . .	Remington, model 1870 . . .	17	do	No remarks				
	Springfield, model 1870 . . .	17	do	do			} Springfield . . .	{ Lieut. D. H. Kelton commanding.
	Sharps, model 1870	19	do	do				
1872.								
Jan	Remington, model 1870 . . .	17	do	do	120			
	Springfield, model 1870 . . .	17	do	do	120	2	} Springfield . . .	{ Lieut. D. H. Kelton commanding.
	Sharps, model 1870	19	do	do	154			
April . . .	Remington, model 1870 . . .	17	do	do				
	Springfield, model 1870 . . .	17	do	do			} Springfield . . .	
	Sharps, model 1870	19	do	do				
Aug	Remington, model 1870 . . .	14	do	do				
	Springfield, model 1870 . . .	13	1; wagon fell on it	Does not eject shells well; hammer and breech-block work badly after firing.				{ See special report; more than 3 failed; the cartridges were a short time under water.
	Sharps, model 1870	16	None reported	No remarks	800			
	Ward-Burton, model 1870 . . .	19	1; wagon fell on it	Not at all satisfactory. (See report) . . .				
TOTALS.								
Kind of arms.				Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.	
Remington, model 1870				18	None reported		1,085	11
Springfield, model 1870				18	do		1,075	3
Sharps, model 1870				19	do		1,104	17
Ward-Burton, model 1870				19	do			

Special report made by Captain N. Prime, Tenth Infantry, August, 1872.—From practical experience on escort duty, I find the following defects in the rifles in the hands of my company:

The Remington will not eject the shell; besides, after firing a few times, the hammer and breech-piece do not work well, the breech-piece sticks, and it is difficult to remove the old shell; it is also a great objection not being able to load the piece at half-cock.

The Ward-Burton is not at all satisfactory as a service arm. The little catch on the side of the lock is liable at all times to get clogged; if dust or sand is blowing it is impossible to keep it in order; a very small particle of sand will necessitate taking the whole thing apart; also the spiral spring is most decidedly an objection. The enlisted men complain that it is unserviceable, and generally consider it a dangerous arm; cocking itself when loaded is certainly a great objection.

The Sharps rifle has not been in use in my company during the last month.

Company D, Tenth Infantry, Captain E. E. Sellers commanding; Sharps rifle-muskets issued November 6, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
	Sharps, model 1870	16	None reported	Inferior to Springfield, being heavier, not so accurate, and more complicated.	.....	.....	Springfield.....	

Company A, Eleventh Infantry, Captain George L. Choisy commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges		Preference.	Remarks.
					fired.	failed.		
1871.								
Sept ...	Remington, model 1870..	20	None reported	No remarks.....	60	2	} Springfield...	
	Springfield, model 1870..	20	do	do	80	3		
	Sharps, model 1870	20	do	do	60	3		
Oct	Remington, model 1870..	20	do	To load at half-cock; does not always eject.	64	3	} Springfield...	
	Springfield, model 1870..	20	do	No remarks	57	3		
	Sharps, model 1870	20	do	Does not always eject.....	51	3		
Nov ...	Remington, model 1870..	20	do	To load at half-cock; does not always eject.	46	1	} Springfield...	
	Springfield, model 1870..	20	do	No remarks.....	109	8		
	Sharps, model 1870	20	do	Difference between half-cock and full- cock not sufficient; lever in the way.	64	6		
Dec....	Remington, model 1870..	20	1 barrel bulged out	To load at half-cock; does not always eject.	40		} Springfield...	{ The Remington cannot be loaded and fired as rapidly as the Spring- field.
	Springfield, model 1870..	20	None reported.....	No remarks.....	80	.....		
	Sharps, model 1870	20	do	Difference between half-cock and full- cock not sufficient; lever in the way.	50	.....		
1872.								
Jan	Remington, model 1870..	19	1 firing-pin.....	To load at half-cock; does not always eject.	50		} Springfield...	
	Springfield, model 1870..	19	1 barrel bulged out	No remarks.....	81	1		
	Sharps, model 1870	20	None reported.....	Difference between half-cock and full- cock not sufficient; lever in the way.	50	.....		

Month	Model	Remarks	Weight	Remarks	Remarks	Remarks	Remarks
Feb....	Remington, model 1870..	do.....	19	To load at half-cock; does not always eject.	48	2	Springfield...
	Springfield, model 1870..	do.....	19	No remarks.	64	2	
	Sharps, model 1870.....	do.....	19	Difference between half-cock and full-cock not sufficient; lever in the way.	80		
March.	Remington, model 1870..	None reported.....	19	To load at half-cock; does not always eject.	25		
	Springfield, model 1870..	do.....	19	No remarks.	25		Springfield...
	Sharps, model 1870.....	do.....	19	Difference between half-cock and full-cock not sufficient; lever in the way.	35		
April..	Remington, model 1870..	do.....	19	To load at half-cock; does not always eject.	30	2	
	Springfield, model 1870..	do.....	19	No remarks.	35	4	Springfield...
	Sharps, model 1870.....	1 stock, 1 lever.....	19	Difference between half-cock and full-cock not sufficient; lever in the way.	20	3	
May...	Remington, model 1870..	None reported.....	19	To load at half-cock; does not always eject.	36		
	Springfield, model 1870..	do.....	19	No remarks.	60		Springfield...
	Sharps, model 1870.....	do.....	17	Difference between half-cock and full-cock not sufficient; lever in the way.	34	2	
June..	Remington, model 1870..	do.....	19	To load at half-cock; does not always eject.	142		
	Springfield, model 1870..	do.....	19	No remarks.	132		Springfield...
	Sharps, model 1870.....	do.....	17	Difference between half-cock and full-cock not sufficient; lever in the way.	136	1	
July...	Ward-Burton, model 1870..	do.....	20	No remarks.			
	Remington, model 1870..	1 mainspring.....	19	To load at half-cock; does not always eject.			
	Springfield, model 1870..	None reported.....	19	No remarks.			Springfield...
	Ward-Burton, model 1870..	do.....	20	Too complicated; dangerous in hands of careless men.			
Aug...	Remington, model 1870..	do.....	19	To load at half-cock; does not always eject.	40		
	Springfield, model 1870..	do.....	19	No remarks.	60		Springfield...
	Ward-Burton, model 1870..	do.....	20	Too complicated; dangerous in hands of careless men.	140		
Sept...	Remington, model 1870..	do.....	19	To load at half-cock; does not always eject.	50	2	
	Springfield, model 1870..	do.....	19	No remarks.	70	3	Springfield...
	Ward-Burton, model 1870..	do.....	20	Sometimes impossible to fire until breech-bolt was pulled back twice.	120	5	
Oct....	Remington, model 1870..	do.....	19	To load at half-cock; does not always eject.	40		
	Springfield, model 1870..	1 burnt.....	19	No remarks.	70		Springfield...
	Ward-Burton, model 1870..	None reported.....	20	Sometimes impossible to fire until breech-bolt was pulled back twice.	65	2	
Nov...	Remington, model 1870..	do.....	19	To load at half-cock; does not always eject.	20	1	
	Springfield, model 1870..	1 sight, 1 barrel injured.....	19	No remarks.	48	2	Springfield...
	Ward-Burton, model 1870..	1 guard-screw.....	20	Sometimes impossible to fire until breech-bolt was pulled back twice.	70	13	

{ Barrels became heated after firing a few shots.

{ 1 cartridge struck 7 times in Ward-Burton and failed; went in Springfield.

Company A, Eleventh Infantry, Captain George L. Choisy commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Dec....	Remington, model 1870.. Springfield, model 1870.. Ward-Burton, model 1870	19 19 20	1 firing-pin spring.. 1 mainspring.. do	Should load at half-cock.. No remarks.. Too complicated .....	..... ..... .....	..... ..... .....	} Springfield..	
1873. Jan....	Remington, model 1870.. Springfield, model 1870.. Ward-Burton, model 1870	19 19 20	None reported do	Should load at half-cock.. No remarks.. Too complicated	50 50 50	 1	} Springfield..	
Feb....	Remington, model 1870.. Springfield, model 1870.. Ward-Burton, model 1870	19 19 20	1 sear-bolt.. None reported do	Should load at half-cock.. No remarks.. Locking-bolt spring frequently clogged by dust.	40 90 80	..... ..... .....	} Springfield..	

TOTALS.

Kinds of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	1 firing-pin spring, 1 firing-pin, 1 barrel, 1 mainspring.....	781	13
Springfield, model 1870.....	20	1 mainspring, 1 barrel, 1 barrel injured, 1 rear-sight.....	1, 111	24
Sharps, model 1870.....	20	1 tumbler, 1 stock, 1 lever.....	580	20
Ward-Burton, model 1870.....	20	1 sear-bolt, 1 guard-screw, 1 mainspring.....	525	20

Company B, Eleventh Infantry, Captain Joseph Conrad commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Oct....	Remington, model 1870.. Springfield, model 1870.. Sharps, model 1870	20 20 19	None reported do	No remarks.. do .....	..... ..... .....	..... ..... .....	..... ..... .....	

Nov ...	Remington, model 1870..	20	do	To load at half-cock	.....	.....	Springfield...
Dec....	Springfield, model 1870..	20	do	No remarks	.....	.....	Springfield...
	Sharps, model 1870	19	do	Too heavy; gun-sling cannot be used	.....	.....	Springfield...
1872.	Remington, model 1870..	20	do	No remarks	.....	.....	Springfield...
Jan....	Springfield, model 1870..	20	do	do	.....	.....	Springfield...
	Sharps, model 1870	19	do	do	.....	.....	Springfield...
Feb....	Remington, model 1870..	19	do	do	.....	.....	Springfield...
	Springfield, model 1870..	20	do	do	.....	.....	Springfield...
March	Sharps, model 1870	19	do	do	.....	.....	Springfield...
	Remington, model 1870..	19	do	do	.....	.....	Springfield...
April ..	Springfield, model 1870..	18	do	do	.....	.....	Springfield...
	Sharps, model 1870	19	do	do	.....	.....	Springfield...
May ...	Remington, model 1870..	18	do	To load at half-cock	.....	.....	Springfield...
	Springfield, model 1870..	20	do	No remarks	.....	.....	Springfield...
	Sharps, model 1870	18	do	Fails to eject shells	.....	.....	Springfield...
			1 stock	To load at half-cock	.....	.....	Springfield...
			None reported	No remarks	.....	.....	Springfield...
			do	Fails to eject shells	.....	.....	Springfield...
June...	Remington, model 1870..	18	do	To load at half-cock	.....	73	Springfield...
	Springfield, model 1870..	20	do	No remarks	.....	74	Springfield...
	Ward-Burton, model 1870	20	do	Greater force for mainspring	.....	74	Springfield...
July ...	Remington, model 1870..	18	2 butt-stocks	To load at half-cock	.....	200	Springfield...
	Springfield, model 1870..	20	1 stock from carelessness	No remarks	.....	200	Springfield...
	Ward-Burton, model 1870	20	None reported	Greater force for mainspring	.....	200	Springfield...
Aug ...	Remington, model 1870..	17	3 stocks	To load at half-cock	.....	280	Springfield...
	Springfield, model 1870..	20	None reported	No remarks	.....	200	Springfield...
	Ward-Burton, model 1870	20	do	Greater force for mainspring	.....	300	Springfield...
Sept ...	Remington, model 1870..	15	do	To load at half-cock	.....	200	Springfield...
	Springfield, model 1870..	18	do	No remarks	.....	200	Springfield...
	Ward-Burton, model 1870	20	do	Greater force for mainspring	.....	200	Springfield...
Oct	Remington, model 1870..	17	do	To load at half-cock	.....	250	Springfield...
	Springfield, model 1870 ..	19	do	No remarks	.....	180	Springfield...
	Ward-Burton, model 1870	20	do	Greater force for mainspring	.....	200	Springfield...
Nov ...	Remington, model 1870..	8	do	To load at half-cock	.....	150	Springfield...
	Springfield, model 1870..	17	do	No remarks	.....	130	Springfield...
	Ward-Burton, model 1870	19	do	Greater force for mainspring	.....	50	Springfield...
Dec....	Remington, model 1870..	13	do	To load at half-cock	.....	190	Springfield...
	Springfield, model 1870..	18	do	No remarks	.....	140	Springfield...
	Ward-Burton, model 1870	19	do	Greater force for mainspring	.....	100	Springfield...

{ Lieutenant George G. Lott commanding.

{ Lieutenant George G. Lott commanding.

{ 1 cartridge failed in Remington and 2 in Ward-Burton, afterwards fired in Springfield.

{ Lieutenant A. L. Myer commanding. Many cartridges failed in Ward-Burton, were fired in Springfield.

{ Lieutenant W. C. Beach commanding. Many cartridges failed in Ward-Burton and were fired in Springfield.

{ Lt. W. C. Beach commanding; same remarks.

{ Lt. W. C. Beach commanding; same remarks.

{ Lieut. W. C. Beach commanding.

{ Lieut. W. C. Beach commanding.

Company B, Eleventh Infantry, Captain Joseph Conrad commanding—Continued.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	6 butt-stocks.....	2,943	192
Springfield, model 1870.....	20	1 stock.....	2,724	65
Sharps, model 1870.....	20	None reported.....	1,874	100
Ward-Burton, model 1870.....	20	do.....	850	95

Company D, Eleventh Infantry, Captain H. L. Chipman commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
April ..	Remington, model 1870 ..	20	None reported ..	Better means of ejecting the shell ..	174	84	{ Springfield...	{ Cartridges had been damaged.
	Springfield, model 1870 ..	20	do ..	No remarks ..	174	84	{ Springfield...	{ Cartridges had been damaged.
	Sharps, model 1870 ..	20	do ..	do ..	175	84	{ Springfield...	{ Cartridges had been damaged.
May ..	Remington, model 1870 ..	20	do ..	Better means of ejecting the shell ..	492	165	{ Springfield...	{ Cartridges had been damaged.
	Springfield, model 1870 ..	20	do ..	No remarks ..	492	163	{ Springfield...	{ Cartridges had been damaged.
	Sharps, model 1870 ..	20	do ..	do ..	492	163	{ Springfield...	{ Cartridges had been damaged.
June ..	Remington, model 1870 ..	20	do ..	Better means of ejecting the shell ..	190	139	{ Springfield...	{ Cartridges had been damaged.
	Springfield, model 1870 ..	20	do ..	No remarks ..	320	163	{ Springfield...	{ Cartridges had been damaged.
	Sharps, model 1870 ..	20	do ..	do ..	210	158	{ Springfield...	{ Cartridges had been damaged.
July ..	Remington, model 1870 ..	20	do ..	Better means of ejecting the shell ..	300	81	{ Springfield...	{ Cartridges had been damaged.
	Springfield, model 1870 ..	20	do ..	No remarks ..	310	98	{ Springfield...	{ Cartridges had been damaged.
	Sharps, model 1870 ..	20	do ..	Some method of ejecting the shell ..	290	106	{ Springfield...	{ Cartridges had been damaged.
Aug ..	Remington, model 1870 ..	19	do ..	Better means of ejecting the shell ..	360	44	{ Springfield...	{ Cartridges had been damaged.
	Springfield, model 1870 ..	20	do ..	No remarks ..	320	32	{ Springfield...	{ Cartridges had been damaged.
	Sharps, model 1870 ..	20	do ..	Some method of ejecting the shell ..	260	48	{ Springfield...	{ Cartridges had been damaged.
Sept ..	Remington, model 1870 ..	19	do ..	Better means of ejecting the shell ..	720	88	{ Springfield...	{ Cartridges had been damaged.
	Springfield, model 1870 ..	20	1 stock ..	No remarks ..	672	72	{ Springfield...	{ Cartridges had been damaged.
	Sharps, model 1870 ..	20	None reported ..	Some method of ejecting the shell ..	646	84	{ Springfield...	{ Cartridges had been damaged.
	Ward-Burton, model 1870 ..	20	do ..	No remarks ..			{ Springfield...	{ Cartridges had been damaged.
	Remington, model 1870 ..	19	do ..	Better means of ejecting the shell ..	290	2	{ Springfield...	{ Cartridges had been damaged.
	Springfield, model 1870 ..	20	do ..	No remarks ..	368		{ Springfield...	{ Cartridges had been damaged.
	Sharps, model 1870 ..	20	do ..	Some method of ejecting the shell ..			{ Springfield...	{ Cartridges had been damaged.
	Ward-Burton, model 1870 ..	20	do ..	No remarks ..	332	2	{ Springfield...	{ Cartridges had been damaged.

Nov ...	Remington, model 1870...	19	do	Better means of ejecting the shell	290	4	Springfield...
	Springfield, model 1870...	20	do	No remarks	340	2	
	Sharps, model 1870...	20	do	Some method of ejecting the shell			
	Ward-Burton, model 1870...	20	do	No remarks	430	6	
Dec...	Remington, model 1870...	19	1 mainspring	Some method of ejecting the shell	290	10	Springfield...
	Springfield, model 1870...	19	None reported	No remarks	230	8	
	Sharps, model 1870...	20	do	do			
	Ward-Burton, model 1870...	20	do	do	315	15	
1873.							
Jan ...	Remington, model 1870...	19	do	Some method of ejecting the shell	112	15	Springfield...
	Springfield, model 1870...	19	do	No remarks	100	9	
	Ward-Burton, model 1870...	20	do	do	112	28	
Feb....	Remington, model 1870...	19	do	Some method of ejecting the shell	135	17	Springfield...
	Springfield, model 1870...	19	do	No remarks	150	8	
	Ward-Burton, model 1870...	20	do	do	150	25	

TOTALS.

Kind of arms.	Origin-ally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870...	20	1 mainspring		3,343	649
Springfield, model 1870...	20	1 stock		3,476	681
Sharps, model 1870...	20	None reported		2,073	643
Ward-Burton, model 1870...	20	do		1,329	76

Company H, Eleventh Infantry, Captain R. McClermont commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871.

Date of re-port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept ...	Springfield, model 1870...	50	None reported	No remarks				
	Sharps, model 1870...	14	do	Lower swivel be removed; stronger main-spring.	236	6	Springfield...	{ Cartridges which fail in Sharps are fired in Springfield.
1873. Jan ...	Springfield, model 1870...	48	do	No remarks	10	1		
	Sharps, model 1870...	12	do	Lower swivel be removed; stronger main-spring.	30	7	Springfield...	

Company H, Eleventh Infantry, Captain R. McClermont commanding—Continued.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Springfield, model 1870	50	None reported	10	1
Sharps, model 1870	14	do	30	7

Company A, Twelfth Infantry, Captain E. C. Woodruff commanding.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
	Springfield, model 1870 ..	57	None reported	No remarks	375	.....	.....	.....

Company E, Twelfth Infantry, Captain Richard C. Parker commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

1871.	Date of report.	Kind of arms.	On hand.	Lost by desertion.	No remarks.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
July ...		Remington, model 1870 ..	19	None reported .....	.....	96	.....	.....	.....
		Springfield, model 1870 ..	20	do .....	.....	96	.....	.....	.....
		Sharps, model 1870	20	do .....	.....	96	.....	.....	.....
Aug ...		Remington, model 1870 ..	19	do .....	.....	128	.....	Remington, if made to load at half-cock.	.....
		Springfield, model 1870 ..	20	do .....	.....	128	.....	do .....	.....
		Sharps, model 1870	20	do .....	.....	128	.....	do .....	.....
Sept ...		Remington, model 1870 ..	19	do .....	.....	30	1	Remington, if made to load at half-cock.	.....
		Springfield, model 1870 ..	20	do .....	.....	30	2	do .....	.....
		Sharps, model 1870	20	do .....	.....	30	2	do .....	.....
Oct ...		Remington, model 1870 ..	19	do .....	.....	62	2	Remington, if made to load at half-cock.	Lieutenant T. F. Wright commanding.
		Springfield, model 1870 ..	20	do .....	.....	66	.....	do .....	.....
		Sharps, model 1870	20	do .....	.....	66	.....	do .....	.....
Nov ...		Remington, model 1870 ..	19	do .....	.....	128	.....	Remington, if made to load at half-cock.	.....
		Springfield, model 1870 ..	20	do .....	.....	80	.....	do .....	.....
		Sharps, model 1870	20	do .....	.....	92	.....	do .....	.....

Dec....	Remington, model 1870..	19	do	do	do	122	2	Remington, if made to load at half-cock.
1872.	Springfield, model 1870..	20	do	do	do	130	1	
Jan....	Sharps, model 1870	20	1 guard	do	do	130		
	Remington, model 1870..	19	None reported	do	do	57		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	63		
	Sharps, model 1870	20	do	do	do	63		
Feb....	Remington, model 1870..	19	do	do	do			Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do			
	Sharps, model 1870	20	do	do	do			
March	Remington, model 1870..	19	do	do	do	120	1	Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	131	2	
	Sharps, model 1870	20	do	do	do	131		
April ..	Remington, model 1870..	19	do	do	do	114		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	123		
	Sharps, model 1870	20	1 broken	do	do	123	2	
May	Remington, model 1870..	18	1 lost.	do	do	42		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	None reported	do	do	54		
	Sharps, model 1870	20	1 broken	do	do	54		
June....	Remington, model 1870..	18	None reported	do	do	70		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	98		
	Sharps, model 1870	20	do	do	do	80		
July	Remington, model 1870..	18	do	do	do	49		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	66	2	
	Sharps, model 1870	20	do	do	do	56		
Aug	Remington, model 1870..	13	do	do	do	120		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	140		
	Ward-Burton, model 1870	20	do	do	do	140		
Sept ...	Remington, model 1870..	18	do	do	do	60		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	90	2	
	Ward-Burton, model 1870	20	do	do	do	90		
Oct	Remington, model 1870..	18	do	do	do	78		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	93	2	
	Ward-Burton, model 1870	20	do	do	do	93		
Nov	Remington, model 1870..	18	do	do	do	68		Remington, if made to load at half-cock.
	Springfield, model 1870..	20	do	do	do	84		
	Ward-Burton, model 1870	20	do	do	do	84		
Dec....	Remington, model 1870..	18	2 rear-sights	do	do	70	3	Remington, if made to load at half-cock.
	Springfield, model 1870..	20	None reported	do	do	80	5	
	Ward-Burton, model 1870	20	2 guard-screws	do	do	80		

Lieut. T. F. Wright commanding.

Company E, Twelfth Infantry, Captain Richard C. Parker commanding—Continued.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	2 rear-sights.....	1,414	8
Springfield, model 1870.....	20	None reported.....	1,552	1
Sharps, model 1870.....	20	1 guard.....	1,049	9
Ward-Burton, model 1870.....	20	2 guard-screws.....	477	7

Company H, Twelfth Infantry, Captain M. H. Stacey commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
June...	Remington, model 1870...	20	None reported.....	No remarks.....	120	20	.....	
	Springfield, model 1870...	20	do.....	do.....	120	20	.....	
	Sharps, model 1870.....	20	do.....	do.....	120	31	.....	
Nov...	Remington, model 1870...	20	1 mainspring.....	do.....	400	50	.....	.....
	Springfield, model 1870...	20	2 scar-springs.....	do.....				
	Sharps, model 1870.....	20	1 firing-pin.....	do.....				
Dec....	Remington model 1870...	20	None reported.....	do.....	130	25	} Springfield...	.....
	Springfield, model 1870...	20	do.....	do.....	140	20		
	Sharps, model 1870.....	20	do.....	do.....	130	30		
1872.								
Jan....	Remington, model 1870...	20	1 firing-pin.....	do.....	60	2	} Springfield...	.....
	Springfield, model 1870...	20	None reported.....	do.....	60	.....		
	Sharps, model 1870.....	20	do.....	do.....	60	.....		
Feb....	Remington, model 1870...	20	do.....	do.....	80	3	} Springfield...	.....
	Springfield, model 1870...	20	do.....	do.....	80	.....		
	Sharps, model 1870.....	20	do.....	do.....	80	.....		
March..	Remington, model 1870...	20	do.....	do.....	100	3	} Springfield...	.....
	Springfield, model 1870...	20	do.....	do.....	100	.....		
	Sharps, model 1870.....	20	do.....	do.....	100	.....		
April..	Remington, model 1870...	20	do.....	do.....	140	.....	} Springfield...	.....
	Springfield, model 1870...	20	do.....	do.....	140	.....		
	Sharps, model 1870.....	20	do.....	do.....	140	.....		

Company H, Twelfth Infantry, Captain M. H. Stacey commanding—Continued.

TOTALS.

Kind of arms.	Orig- inally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, model 1870.....	20	1 firing-pin.....	630	53
Springfield, model 1870.....	20	None reported.....	640	40
Sharps, model 1870.....	20	do.....	630	61

Company I, Twelfth Infantry, Captain E. F. Thompson commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
June. {	Remington, model 1870..	20	None reported	No remarks.....	188	1	Springfield....	
July. {	Springfield, model 1870..	88	do.....	do.....				
	Sharps, model 1870.....	20	do.....	do.....				
Aug...	Remington, model 1870..	20	do.....	do.....	124	1	Springfield....	
	Springfield, model 1870..	80	do.....	do.....	115	1		
	Sharps, model 1870.....	20	do.....	do.....	87			
Sept...	Remington, model 1870..	20	do.....	do.....	90			
	Springfield, model 1870..	20	do.....	do.....	118	1	Springfield....	
	Sharps, model 1870.....	20	do.....	do.....	99	1		
Oct...	Remington, model 1870..	20	do.....	do.....	18			
	Springfield, model 1870..	20	do.....	do.....	27		Springfield....	
	Sharps, model 1870.....	20	do.....	do.....	24			
Nov...	Remington, model 1870..	20	do.....	do.....	53			
	Springfield, model 1870..	20	do.....	do.....	78		Springfield....	
	Sharps, model 1870.....	20	do.....	do.....	67			
Dec...	Remington, model 1870..	20	do.....	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	35			
				No remarks.....				
	Springfield, model 1870..	20	do.....	Same as Remington, except in loading; want of power to eject; great recoil.	41		Springfield....	
	Sharps, model 1870.....	20	do.....		39			

Company I, Twelfth Infantry, Captain E. F. Thompson commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.	Remington, model 1870.	20	None reported	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	.....	.....	.....	.....
Jan....	Springfield, model 1870.	20	do	No remarks.	.....	.....	Springfield...	.....
Feb....	Sharps, model 1870	20	do	Same as Remington, except in loading; want of power to eject; great recoil.	.....	.....	.....	.....
March..	Remington, model 1870..	20	do	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	45	1	.....	.....
	Springfield, model 1870..	20	do	No remarks.	62	.....	Springfield...	.....
	Sharps, model 1870	20	do	Same as Remington, except in loading; want of power to eject; great recoil.	49	.....	.....	.....
April..	Remington, model 1870..	20	do	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	28	2	.....	.....
	Springfield, model 1870..	20	do	No remarks.	86	.....	Springfield...	.....
	Sharps, model 1870	20	do	Same as Remington, except in loading; want of power to eject; great recoil.	50	.....	.....	.....
May...	Remington, model 1870..	20	do	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	56	9	.....	.....
	Springfield, model 1870..	20	do	No remarks.	80	7	Springfield...	.....
	Sharps, model 1870	20	do	Same as Remington, except in loading; want of power to eject; great recoil.	50	10	.....	.....
June...	Remington, model 1870..	20	do	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	97	2	.....	.....
	Springfield, model 1870..	20	do	No remarks.	97	.....	Springfield...	.....
	Ward-Burton, model 1870	20	do	Dangerous in the hands of inexperienced troops.	42	.....	.....	.....
July to Dec., inclusive.	Remington, model 1870.	20	do	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	.....	.....	.....	.....
	Springfield, model 1870.	20	do	No remarks.	.....	.....	Springfield...	.....
	Ward-Burton, model '70	20	do	Dangerous in the hands of inexperienced troops.	.....	.....	.....	.....
1873.	Remington, model 1870..	20	do	Dangerous to load at half-cock; tiresome to carry in prescribed positions; stock too light.	.....	.....	.....	.....
Jan....	Springfield, model 1870..	20	do	No remarks.	.....	.....	Springfield...	.....
	Ward-Burton, model 1870	20	do	Dangerous, being too easily loaded	.....	.....	.....	.....

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	None reported.....	536	14
Springfield, model 1870.....	20	do.....	698	9
Sharps, model 1870.....	20	do.....	465	11
Ward-Burton, model 1870.....	20	do.....	42	10

Company K, Twelfth Infantry, Captain Charles S. Tripler commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.	Remington, model 1870...	20	None reported.....	Should load at half-cock; does not eject shells.	72	.....	.....	.....
July...	Springfield, model 1870...	20	1 barrel burst.....	No remarks.....	42	.....	Springfield...	.....
	Sharps, model 1870.....	20	None reported.....	Does not eject shells; sling in the way.....	76	.....	.....	.....
Aug...	Remington, model 1870...	20	do.....	Should load at half-cock; does not eject shells.	52	.....	.....	.....
	Springfield, model 1870...	20	do.....	No remarks.....	82	.....	Springfield...	.....
Sept...	Sharps, model 1870.....	20	do.....	Does not eject shells; sling in the way.....	88	1	.....	.....
	Remington, model 1870...	20	do.....	Should load at half-cock; does not eject shells.	37	3	.....	.....
	Springfield, model 1870...	20	do.....	No remarks.....	14	1	Springfield...	.....
Oct...	Sharps, model 1870.....	20	do.....	Does not eject shells; sling in the way.....	18	.....	.....	.....
	Remington, model 1870...	20	do.....	Should load at half-cock; does not eject shells.	80	3	.....	.....
	Springfield, model 1870...	20	do.....	No remarks.....	53	4	Springfield...	.....
Nov...	Sharps, model 1870.....	20	do.....	Does not eject shells; sling in the way.....	64	2	.....	.....
	Remington, model 1870...	20	do.....	Should load at half-cock; does not eject shells.	121	1	.....	.....
	Springfield, model 1870...	20	do.....	No remarks.....	72	2	Springfield...	.....
Dec....	Sharps, model 1870.....	20	do.....	Does not eject shells; sling in the way.....	82	1	.....	.....
	Remington, model 1870...	20	do.....	Should load at half-cock; does not eject shells.	112	1	.....	.....
	Springfield, model 1870...	20	do.....	No remarks.....	58	1	Springfield...	.....
	Sharps, model 1870.....	20	do.....	Does not eject shells; sling in the way.....	72	1	.....	.....

Company K, Twelfth Infantry, Captain Charles S. Tripler commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Jan....	Remington, model 1870..	20	None reported	Should load at half-cock; does not eject shells.	54	1		
	Springfield, model 1870..	20	do	No remarks	42	2	Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...	47	1		
Feb....	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.				
	Springfield, model 1870..	20	do	No remarks			Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...				
March.	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	169	3		
	Springfield, model 1870..	20	do	No remarks	127	3	Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...	115	2		
April ..	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	129	1		
	Springfield, model 1870..	20	do	No remarks	66	1	Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...	79	2		
May ...	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	96			
	Springfield, model 1870..	20	do	No remarks	94		Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...	72			
June...	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	95			
	Springfield, model 1870..	20	do	No remarks	90		Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...	68			
July ...	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	114			
	Springfield, model 1870..	20	do	No remarks	70	1	Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...	56	2		
Aug ...	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	110			
	Springfield, model 1870..	20	do	No remarks	25	1	Springfield...	
	Sharps, model 1870	20	do	Does not eject shells; sling in the way...	31	1		
	Ward-Burton, model 1870..	20	do	Much inferior to any of the other systems.	36			
Sept ...	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	65			
	Springfield, model 1870..	20	do	No remarks	24		Springfield...	
	Ward-Burton, model 1870..	20	do	Much inferior to any of the other systems.	71	1		
Oct	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	86	2	Remington, loading at half-cock.	Lieutenant T. F. Wright commanding.
	Springfield, model 1870..	19	do	No remarks	40			
	Ward-Burton, model 1870..	20	do	Much inferior to any of the other systems.	81			

Nov ...	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	91		Remington, if modified so as to load at half-cock.	Lieutenant T. F. Wright commanding.
Dec....	Springfield, model 1870..	19	do	No remarks.	37			Lieutenant G. W. Kingsbury commanding.
	Ward-Burton, model 1870..	20	do	Much inferior to any of the other systems.	86	.....	.....	
	Remington, model 1870..	20	do	Should load at half-cock; does not eject shells.	86	2	Remington, if modified so as to load at half-cock.	
	Springfield, model 1870..	19	do	No remarks.	28	.....	.....	
1873. Jan ...	Ward-Burton, model 1870..	20	do	Much inferior to any of the other systems.	105			Lieutenant G. W. Kingsbury commanding.
	Remington, model 1870..	20	do	Should load at half-cock and have an ejector.	72	3	.....	
Feb...	Springfield, model 1870..	19	do	No remarks.	12	.....	.....	
	Ward-Burton, model 1870..	20	do	Much inferior to any of the other systems.	75	3	.....	
	Remington, model 1870..	20	do	Should load at half-cock and have an ejector.	42	.....	.....	
	Springfield, model 1870..	19	do	No remarks.	46	.....	.....	
	Ward-Burton, model 1870..	20	do	Much inferior to any of the other systems.	49			

TOTALS.

Kind of arms.		Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870..	.....	20	.....	.....	1,683	20
Springfield, model 1870..	.....	20	.....	.....	1,022	16
Sharps, model 1870..	.....	20	.....	.....	868	13
Ward-Burton, model 1870..	.....	20	.....	.....	503	4

Company A, Thirteenth Infantry, Captain R. A. Torrey commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. May ...	Remington, model 1870..	20	1 mainspring, 1 musket, (run over.)	To load at half-cock.	.....	.....	.....	.....
June...	Springfield, model 1870..	19	None reported	No remarks.	.....	.....	Springfield...	.....
	Sharps, model 1870	20	1 barrel burst	do	.....	.....	.....	.....
	Remington, model 1870..	20	None reported	do	.....	.....	.....	.....
	Springfield, model 1870..	20	do	do	.....	.....	Springfield...	.....
	Sharps, model 1870	20	do	do	.....	.....	.....	.....

Company A, Thirteenth Infantry, Captain R. A. Torrey commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
July ...	Remington, model 1870..	19	None reported	No remarks.....	33	.....	Springfield...	
	Springfield, model 1870..	19	do	do	33	.....	Springfield...	
	Sharps, model 1870	19	do	do	33	.....	Springfield...	
Aug ...	Remington, model 1870..	19	do	do				
	Springfield, model 1870..	19	1 stock.....	do	60	.....	Springfield...	
	Sharps, model 1870	19	None reported	do				
Sept ...	Remington, model 1870..	20	do	To load at half-cock			Springfield...	
	Springfield, model 1870 ..	19	do	No remarks.....			Springfield...	
	Sharps, model 1870	20	do	do			Springfield...	
Oct ...	Remington, model 1870..	20	do	do			Springfield...	
	Springfield, model 1870..	19	do	do			Springfield...	
	Sharps, model 1870	20	do	do			Springfield...	
Nov ...	Remington, model 1870..	20	do	do	88	.....	Springfield...	
	Springfield, model 1870..	19	do	do	140	.....	Springfield...	
	Sharps, model 1870	20	do	do	90	.....	Springfield...	
Dec ...	Remington, model 1870..	20	do	do	73	.....	Springfield...	
	Springfield, model 1870..	19	do	do	125	.....	Springfield...	
	Sharps, model 1870	20	do	do	72	.....	Springfield...	
1872.								
Jan... }	Remington, model 1870..	20	do	do	220	.....	Springfield...	
Feb... }	Springfield, model 1870..	19	do	do	260	.....	Springfield...	
March	Sharps, model 1870	20	do	do	220	.....	Springfield...	
	Remington, model 1870..	20	do	do	222	.....	Springfield...	
	Springfield, model 1870..	19	do	do	272	.....	Springfield...	
	Sharps, model 1870	20	do	do	225	.....	Springfield...	
April ...	Remington, model 1870..	20	do	Mainspring should be stronger	224	19	Springfield...	
	Springfield, model 1870..	19	do	No remarks.....	224	3	Springfield...	
	Sharps, model 1870	20	do	do	224	1	Springfield...	
June ...	Remington, model 1870..	20	1 mainspring	do	208	1	Springfield...	
	Springfield, model 1870..	19	None reported	do	208		Springfield...	
	Sharps, model 1870	20	do	do	148		Springfield...	
	Ward-Burton, mod. 1870 ..	20	do	do	60		Springfield...	
July ...	Remington, model 1870..	20	do	do	232		Springfield...	
	Springfield, model 1870..	19	1 stock.....	do	232		Springfield...	
	Ward-Burton, mod. 1870..	20	None reported	do	232		Springfield...	
	Remington, model 1870..	20	1 chamber damaged in attempt to extract bursted shell.	do	220	2	Springfield...	
Aug ...	Remington, model 1870..	20	do	do			Springfield...	
	Springfield, model 1870..	19	None reported	do	220	1	Springfield...	
	Ward-Burton, mod. 1870..	20	do	do	220		Springfield...	

Sept . . .	Remington, model 1870 . . .	20	do . . .	do . . .	226	Springfield . . .
	Springfield, model 1870 . . .	19	do . . .	do . . .	226	
	Ward-Burton, mod. 1870 . . .	20	do . . .	do . . .	226	
Oct . . .	Remington, model 1870 . . .	20	do . . .	do . . .	220	9
	Springfield, model 1870 . . .	19	do . . .	do . . .	220	
	Ward-Burton, mod. 1870 . . .	20	do . . .	do . . .	220	4
Nov . . .	Remington, model 1870 . . .	20	do . . .	do . . .	225	1
	Springfield, model 1870 . . .	19	do . . .	do . . .	225	1
	Ward-Burton, mod. 1870 . . .	20	do . . .	do . . .	225	
Dec . . .	Remington, model 1870 . . .	20	do . . .	do . . .	279	2
	Springfield, model 1870 . . .	19	do . . .	do . . .	279	
	Ward-Burton, mod. 1870 . . .	20	do . . .	do . . .	279	
1873.						
Jan . . .	Remington, model 1870 . . .	20	do . . .	Mainspring too weak . . .	216	4
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .	229	1
	Ward-Burton, mod. 1870 . . .	20	do . . .	do . . .	240	4
Feb . . .	Remington, model 1870 . . .	20	1 mainspring, 1 firing-pin . . .	Mainspring too weak . . .	220	1
	Springfield, model 1870 . . .	19	None reported . . .	No remarks . . .	220	
	Ward-Burton, mod. 1870 . . .	20	do . . .	do . . .	220	

TOTALS.

Kind of arms.	Orig- nally issued.	Broken parts belonging to the system.		Cartridges fired.	Car- tridges failed.
Remington, model 1870 . . .	20	3 mainsprings, 1 firing-pin . . .		2,922	39
Springfield, model 1870 . . .	20	2 stocks . . .		3,433	3
Sharps, model 1870 . . .	20	1 barrel . . .		1,232	3
Ward-Burton, model 1870 . . .	20	None reported . . .		1,922	9

Company C, Thirteenth Infantry, Captain A. L. Hough commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871, and Ward-Burton rifle-muskets issued March 7, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. May . . .	Remington, model 1870 . . .	20	None reported . . .	No remarks . . .				
	Springfield, model 1870 . . .	20	do . . .	do . . .				
	Sharps, model 1870 . . .	20	do . . .	do . . .				

Company C, Thirteenth Infantry, Captain A. L. Hough commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870 ..	20	None reported	More powerful ejector; gun-sling swivel larger.	.....	.....	.....	
July...	Springfield, model 1870 ..	20	do.....	No remarks .....	.....	.....	.....	
	Sharps, model 1870	20	do.....	Heavy, cumbersome, and complicated.	.....	.....	.....	
	Remington, model 1870 ..	20	do.....	More powerful ejector; gun-sling swivel larger.	.....	.....	.....	
	Springfield, model 1870 ..	20	do.....	No remarks .....	.....	.....	Springfield...	
Aug...	Sharps, model 1870	20	do.....	Heavy, cumbersome, and complicated.	.....	.....	.....	
	Remington, model 1870 ..	20	do.....	More powerful ejector; gun-sling swivel larger.	150	2	.....	
	Springfield, model 1870 ..	20	do.....	No remarks	200	.....	Springfield...	
	Sharps, model 1870	20	do.....	Heavy, cumbersome, and complicated.	150	3	.....	
Nov...	Remington, model 1870 ..	20	do.....	More powerful ejector; gun-sling swivel larger.	300	.....	.....	
	Springfield, model 1870 ..	19	1 tumbler	No remarks	300	.....	Springfield...	
	Sharps, model 1870	20	1 sear	Heavy, cumbersome, and complicated.	300	2	.....	
	Remington, model 1870 ..	19	None reported	More powerful ejector; gun-sling swivel larger.	260	1	.....	
Dec....	Springfield, model 1870 ..	20	do.....	No remarks	260	.....	Springfield...	All fired in Springfield.
	Sharps, model 1870	20	do.....	Heavy, cumbersome, and complicated.	260	10	.....	
	Remington, model 1870 ..	19	do.....	More powerful ejector; gun-sling swivel larger.	.....	.....	.....	
	Springfield, model 1870 ..	20	do.....	No remarks .....	.....	.....	Springfield...	
1872. Feb....	Sharps, model 1870	20	do.....	Heavy, cumbersome, and complicated.	.....	.....	.....	
	Remington, model 1870 ..	19	do.....	More powerful ejector; gun-sling swivel larger.	.....	.....	.....	
	Springfield, model 1870 ..	20	do.....	No remarks .....	.....	.....	Springfield...	
	Sharps, model 1870	20	do.....	Heavy, cumbersome, and complicated.	.....	.....	.....	
April...	Remington, model 1870 ..	19	3 rear-sights	More powerful ejector; gun-sling swivel larger.	400	.....	.....	
	Springfield, model 1870 ..	20	None reported	No remarks	400	.....	.....	
	Ward-Burton, model 1870 ..	20	1 rear-sight	do.....	400	.....	.....	
	Remington, model 1870 ..	19	None reported	More powerful ejector; gun-sling swivel larger.	300	1	.....	
June...	Springfield, model 1870 ..	20	do.....	No remarks	300	.....	.....	
	Ward-Burton, model 1870 ..	20	do.....	The breech-bolts foul after using several times.	300	.....	Springfield...	
	Remington, model 1870 ..	19	do.....	No remarks	200	.....	.....	
	Springfield, model 1870 ..	20	do.....	More easily handled and kept clean; efficient in dust and rain.	200	.....	.....	
Aug...	Ward-Burton, model 1870 ..	20	do.....	Cartridges discharged by sand blown into the receiver.	200	.....	Springfield...	
	Remington, model 1870 ..	19	do.....	No remarks	300	.....	.....	
	Springfield, model 1870 ..	20	do.....	do.....	400	.....	Springfield...	
	Ward-Burton, model 1870 ..	20	do.....	do.....	300	.....	Springfield...	

Oct . . .	Remington, model 1870 . .	19	do	The screw-heads of all the arms are too soft.	200	Springfield . . .
	Springfield, model 1870 . .	20	do	No remarks	200	
	Ward-Burton, model 1870 . .	20	do	do	200	
Nov . . .	Remington, model 1870 . .	19	1 damaged by fire . . .	do	200	
	Springfield, model 1870 . .	20	do	do	200	
	Ward-Burton, model 1870 . .	20	4 damaged by fire; 2 shells in barrels immovable.	So many accidents have occurred with the Ward-Burton the men are afraid to use them. (See letter Dec. 1, below.)	100	Springfield . . .
Dec . . .	Remington, model 1870 . .	19	None reported	No remarks	250	2
	Springfield, model 1870 . .	20	do	do	250	Springfield . . .
	Ward-Burton, model 1870 . .	20	do	do		Fired in Springfield.
1873.						
Jan . . .	Remington, model 1870 . .	18	do	do	250	10
	Springfield, model 1870 . .	18	do	do	250	
	Ward-Burton, model 1870 . .	14	do	do		
Feb . . .	Remington, model 1870 . .	18	do	do	125	
	Springfield, model 1870 . .	18	do	do	125	
	Ward-Burton, model 1870 . .	14	do	do		Springfield . . .

{ 500 failed; in all the indentations were $\frac{1}{4}$ to $\frac{3}{8}$ inch from the proper place.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870	20	3 rear-sights	2,935	16
Springfield, model 1870	20	1 tumbler	2,985	15
Sharps, model 1870	20	1 sear	710	15
Ward-Burton, model 1870	20	1 rear-sight	1,500	15

Special report made by Captain A. L. Hough, Thirteenth Infantry, December, 1872.—In forwarding my report on breech-loading arms, &c., for the month of November, I have the honor to add that in consequence of the number of accidents occurring in using the Ward-Burton arm the men of my company are afraid to use them, and for the future, believing them to be dangerous, I shall give the preference to the other arms in target-practice.

As my reports have shown, I would prefer the Springfield to both the other arms, and would like to have that kind alone, but until the matter is decided as to what arm is to be issued, I request that I be furnished with something in place of the Ward-Burton, the Springfield of course preferred.

Company E, Thirteenth Infantry, Captain Robert Nugent commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870...	20	None reported...	No remarks...			} Either Rem- ington or Springfield.	
	Springfield, model 1870...	20	do	do .....	.....	.....		
	Sharps, model 1870	20	do	do .....	.....	.....		
July ...	Remington, model 1870...	20	do	Gun-sling in the way in loading...	60		} Either Rem- ington or Springfield.	
	Springfield, model 1870...	20	do	Fails to eject shells	45	.....		
	Sharps, model 1870	20	do	No remarks	65	2		
Aug ...	Remington, model 1870...	20	do	Fails to eject shells	75		} Springfield ..	
	Springfield, model 1870...	20	do	do	75	.....		
	Sharps, model 1870	20	do	No remarks	50	.....		
Sept. } Oct. ...	Remington, model 1870...	20	do	Fails to eject shells			} Springfield ..	
	Springfield, model 1870...	20	do	do .....	.....	.....		
	Sharps, model 1870	20	do	No remarks .....	.....	.....		
Dec ...	Remington, model 1870...	20	1 firing-pin spring	Fails to eject shells	110		} Springfield ..	
	Springfield, model 1870...	20	None reported	do	110	.....		
	Sharps, model 1870	20	1 firing-pin	No remarks	80	.....		
1872. Jan ...	Remington, model 1870...	20	None reported	do			} Springfield ..	
	Springfield, model 1870...	20	do	No remarks .....	.....	.....		
	Sharps, model 1870	20	do	Fails to eject shells .....	.....	.....		
Feb.	Remington, model 1870...	20	1 mainspring	do			} Springfield ..	
	Springfield, model 1870...	20	None reported	No remarks .....	.....	.....		
	Sharps, model 1870	20	do	Fails to eject shells .....	.....	.....		
April ...	Remington, model 1870...	20	do	do	150		} Springfield ..	
	Springfield, model 1870...	21	do	do	148	2		
	Ward-Burton, model 1870...	20	do	No remarks	225	.....		
May ...	Remington, model 1870...	20	do	Fails to eject shells	120	4	} Springfield ..	
	Springfield, model 1870...	21	do	No remarks	108	6		
	Ward-Burton, model 1870...	20	do	A very good arm, preferable to Reming- ton or Sharps.	180	4		
June ...	Remington, model 1870...	20	do	Fails to eject shells	108	11	} Springfield ..	
	Springfield, model 1870...	21	do	No remarks	108	.....		
	Ward-Burton, model 1870...	20	do	A very good arm, preferable to Reming- ton or Sharps.	153	.....		
July ...	Remington, model 1870...	20	do	Fails to eject shells	192	5	} Springfield ..	
	Springfield, model 1870...	21	do	No remarks	208	5		
	Ward-Burton, model 1870...	20	do	A very good arm, preferable to Reming- ton or Sharps.	160	6		

Sept ...	Remington, model 1870..	20	do	Fails to eject shells	432	Springfield...
	Springfield, model 1870..	21	do	No remarks	408	
	Ward-Burton, model 1870	20	do	A very good arm, preferable to Remington or Sharps.	360	
Oct	Remington, model 1870..	20	do	Fails to eject shells	180	2
	Springfield, model 1870..	21	do	No remarks	168	Springfield...
	Ward-Burton, model 1870	20	do	A very good arm, preferable to Remington or Sharps.	126	
Nov ...	Remington, model 1870..	20	do	Fails to eject shells	186	
	Springfield, model 1870..	21	do	No remarks	141	
	Ward-Burton, model 1870	20	3 breech-bolts	A dangerous and inferior musket.	66	Springfield...
Dec....	Remington, model 1870..	20	None reported	Fails to eject shells	240	
	Springfield, model 1870..	21	do	No remarks	200	Springfield ..
	Ward-Burton, model 1870	20	do	A dangerous and inferior musket	106	{ The best firing done with the Springfield.
1873.						
Jan....	Remington, model 1870..	20	do	Fails to eject shells	235	
	Springfield, model 1870..	21	do	No remarks	200	
	Ward-Burton, model 1870	20	do	Dangerous; 1 breech-bolt blown out, injuring the firer.		Springfield...
Feb....	Remington, model 1870..	20	do	No remarks	201	2
	Springfield, model 1870..	21	do	do	243	Springfield...
	Ward-Burton, model 1870	17	do	do		

TOTALS.

Kind of arms.	Original issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, model 1870	20	1 firing-pin spring, 1 mainspring	2, 289	22
Springfield, model 1870	20	None reported	2, 162	13
Sharps, model 1870	20	1 firing-pin	195	2
Ward-Burton, model 1870	20	3 breech-bolts	1, 376	10

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges fired.	Preference.	Remarks.
1871. May ...	Remington, model 1870...	20	None reported	Barrel, breech-block, hammer, and trig- ger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	76	1	Springfield...	
	Springfield, model 1870...	20	do	Barrel to be bronzed	65			
	Sharps, model 1870...	19	do	Barrel to be bronzed; guard more bent; swivel in the way; too heavy.	45			
June...	Remington, model 1870...	20	1 mainspring	Barrel, breech-block, hammer, and trig- ger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	138	3		
	Springfield, model 1870...	20	None reported	Barrel to be bronzed	103	3	Springfield...	
	Sharps, model 1870...	19	do	Barrel to be bronzed; guard more bent; swivel in the way; too heavy.	85			
July ...	Remington, model 1870...	20	do	Barrel, breech-block, hammer, and trig- ger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	15			
	Springfield, model 1870...	20	do	Barrel to be bronzed	15		Springfield...	
	Sharps, model 1870...	19	do	Barrel to be bronzed; guard more bent; swivel in the way; too heavy.	35			
Aug ...	Remington, model 1870...	20	2 mainsprings, 1 rear-sight slide.	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	155			
	Springfield, model 1870...	20	None reported	Barrel to be bronzed	81		Springfield...	
	Sharps, model 1870...	19	do	Barrel to be bronzed; guard more bent; swivel in the way; too heavy.	114			
Nov ...	Remington, model 1870...	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	20	2		
	Springfield, model 1870...	19	do	Barrel to be bronzed	10		Springfield...	
	Sharps, model 1870...	19	do	Barrel to be bronzed; guard more bent; swivel in the way; too heavy.	30	3		

1872. Jan.. Feb..	Remington, model 1870..	20	1 mainspring.....	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	.....	.....	Springfield...
	Springfield, model 1870..	19	None reported.....	Barrel to be bronzed .....	.....	.....	.....
	Sharps, model 1870.....	19	do	Barrel to be bronzed; guard more bent; swivel in the way; too heavy.	.....	.....	.....
	Remington, model 1870..	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	.....	.....	.....
Mar.. Apr..	Springfield, model 1870..	19	do	Barrel to be bronzed .....	.....	.....	.....
	Ward-Burton, model 1870	20	do	No remarks .....	.....	.....	.....
	Remington, model 1870..	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	102	.....	Springfield...
May ..	Springfield, model 1870..	19	do	Barrel to be bronzed .....	.....	.....	.....
	Ward-Burton, model 1870	20	do	Barrel, top-strap of recoil-block, and well of receiver to be bronzed.	126	1	.....
	Remington, model 1870..	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	150	.....	Springfield...
June ..	Springfield, model 1870..	19	do	Barrel to be bronzed	132	1	.....
	Ward-Burton, model 1870	20	3 trigger-stop screws.....	Barrel, top-strap of recoil-block, and well of receiver to be bronzed.	.....	.....	.....
	Remington, model 1870..	20	None reported.....	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	.....	.....	.....
July ...	Springfield, model 1870..	19	do	Barrel to be bronzed	120	.....	Springfield...
	Ward-Burton, model 1870	20	do	Barrel, top-strap of recoil-block, and well of receiver to be bronzed.	138	.....	.....
	Remington, model 1870..	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	153	.....	.....
Aug ...	Springfield, model 1870..	19	do	Barrel to be bronzed	147	.....	Springfield...
	Ward-Burton, model 1870	20	do	Barrel, top-strap of recoil-block, and well of receiver to be bronzed.	162	1	.....
	Remington, model 1870..	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	126	2	.....
	Springfield, model 1870..	19	do	Barrel to be bronzed	96	.....	Springfield...
	Ward-Burton, model 1870	20	1 breech-bolt.....	Barrel, top-strap of recoil-block, and well of receiver to be bronzed.	120	.....	.....

{ Lieut. Benj. H. Rogers
commanding.

Company G, Thirteenth Infantry, Captain E. W. Clift commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept . . .	Remington, model 1870 . .	20	None reported	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	126	.....	} Springfield . . .	
	Springfield, model 1870 . .	19	do	Barrel to be bronzed	102	.....		
	Ward-Burton, model 1870 . .	20	do	The recoil-block less brittle; locking-bolt and spring accumulate dust.	138	.....		
	Remington, model 1870 . .	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	147	1		
Oct	Springfield, model 1870 . .	19	1 rear-sight leaf-screw	Barrel to be bronzed	133	.....	} Springfield . . .	
	Ward-Burton, model 1870 . .	20	None reported	The recoil-block less brittle; locking-bolt and spring accumulate dust.	138	.....		
Nov	Remington, model 1870 . .	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	150	1	} Springfield . . .	
	Springfield, model 1870 . .	19	do	Barrel to be bronzed	162	.....		
	Ward-Burton, model 1870 . .	20	do	The recoil-block less brittle; locking-bolt and spring accumulate dust.	147	.....		
	Remington, model 1870 . .	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	141	2		
Dec	Springfield, model 1870 . .	19	do	Barrel to be bronzed	162	.....	} Springfield . . .	
	Ward-Burton, model 1870 . .	20	do	The recoil-block less brittle; locking-bolt and spring accumulate dust.	165	2		
1873. Jan	Remington, model 1870 . .	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	150	3	} Springfield . . .	
	Springfield, model 1870 . .	19	do	Barrel to be bronzed	159	.....		
	Ward-Burton, model 1870 . .	20	do	No remarks	183	.....		

Feb....	Remington, model 1870..	20	do	Barrel, breech-block, hammer, and trigger to be bronzed; to load at half-cock; spring-ejector; stock strengthened; comb of hammer longer; guard-swivel longer.	150	2	Springfield....
	Springfield, model 1870..	19	do	Barrel to be bronzed	138	1	
	Ward-Burton, model 1870	20	do	No remarks.....	171	1	

TOTALS.

Kind of arms.		Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870.....		20	4 mainsprings, 1 rear-sight leaf-slide.....		1,801	20
Springfield, model 1870.....		20	1 rear-sight leaf-screw.....		1,618	5
Sharps, model 1870		20	None reported.....		312	3
Ward-Burton, model 1870.....		20	1 breech-bolt, 3 trigger-stop screws		1,507	4

Company I, Thirteenth Infantry, Captain J. T. McGinness commanding; Sharps rifle-muskets issued April 1, 1872.

Date of re-	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873. Jan	Sharps, model 1870	19	None reported	No remarks.....	171	17	Springfield....	

Company A, Fourteenth Infantry, Captain Aug. H. Bainbridge commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

1871. June....	Remington, model 1870..	20	None reported	No remarks.....	100	.....	.....	.....
	Springfield, model 1870..	20	do	do	300	.....	.....	.....
	Sharps, model 1870	20	do	do	100	.....	.....	.....
July ...	Remington, model 1870..	20	do	do	100	.....	.....	.....
	Springfield, model 1870..	20	do	do	100	.....	.....	.....
	Sharps, model 1870	20	do	do	100	.....	.....	.....
Aug. - { Sept. . }	Remington, model 1870..	20	do	do	75	.....	.....	.....
	Springfield, model 1870..	20	do	do	75	4	.....	.....
	Sharps, model 1870	20	do	do	75	.....	.....	.....

Company A, Fourteenth Infantry, Captain Aug. H. Bainbridge commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Oct. Nov. Dec.	Remington, model 1870. Springfield, model 1870. Sharps, model 1870	20 20 20	None reported do 2 rear-sights	No remarks do do	150 150 150			
1872. Feb.	Remington, model 1870. Springfield, model 1870. Sharps, model 1870	20 20 20	2 rear-sights None reported 3 rear-sights	do do do	200 200 200			
April May June July	Remington Remington, model 1870. Springfield, model 1870. Ward-Burton, model 1870	20 20 20 20	None reported do do do	do do do do	250 250 250 250	5 .		
Aug.	Remington, model 1870. Springfield, model 1870. Ward-Burton, model 1870	20 20 20	do do do	do do do	250 250 250	8		
Oct.	Remington, model 1870. Springfield, model 1870. Ward-Burton, model 1870	20 20 20	do do do	do do do	250 250 250	3		
Nov.	Remington, model 1870. Springfield, model 1870. Ward-Burton, model 1870	20 20 20	1 rear-sight None reported do	do do do	250 250 250			
Dec.	Remington, model 1870. Springfield, model 1870. Ward-Burton, model 1870	20 20 20	2 rear-sights None reported do	do do do	250 250 250	3		
1873. Jan.	Remington, model 1870. Springfield, model 1870. Ward-Burton, model 1870	20 19 19	1 rear-sight None reported do	do do do	218 218 218	3 2	 } Springfield	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	5 rear-sights.....	2,968	22
Springfield, model 1870.....	20	None reported.....	3,168	6
Sharps, model 1870.....	20	5 rear-sights.....	1,000	.....
Ward-Burton, model 1870.....	20	1 rear-sight.....	1,968	.....

Company B, Fourteenth Infantry, Captain Guido Ilges commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. Sept....	Springfield, model 1870..	45	2 band-swivel screws, 1 rear-sight base-screw, 1 ejector-spring, 1 side-screw.	No remarks.....	255	.....	} Springfield....	
	Sharps, model 1870	20	None reported	Fails to eject cartridge-shells.....	15	10		

Company E, Fourteenth Infantry, Captain Fred. E. Trotter commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

1871.	Remington, model 1870..	20	None reported	No remarks.....	} Springfield...	{ Ramrods to have swell instead of shoulder.
Nov	Springfield, model 1870..	20	do	do		
Dec..	Sharps, model 1870	20	do	do		
1872.	Remington, model 1870..	20	do	To load at half-cock.....	} Springfield...	{ Ramrods to have swell instead of shoulder.
Feb....	Springfield, model 1870..	20	do	No remarks.....		
	Sharps, model 1870	20	do	do		
	Remington, model 1870.	20	do	To load at half-cock.....	} Springfield...	{ Ramrods to have swell instead of shoulder.
	Springfield, model 1870..	20	do	No remarks.....		
April ..	Sharps, model 1870	20	1 firing-pin.....	do		

Company E, Fourteenth Infantry, Captain Fred. E. Trotter commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872.								
May ...	Remington, model 1870...	20	1 rear-sight leaf	To load at half-cock	50	2	} Springfield...	
	Springfield, model 1870...	20	None reported	No remarks	50	2		
	Ward-Burton, model 1870...	20	do	do	50			
June...	Remington, model 1870...	20	do	To load at half-cock	170		} Springfield...	
	Springfield, model 1870...	20	do	No remarks	570			
	Sharps, model 1870...	20	do	do	60			
	Ward-Burton, model 1870...	20	do	do				
Sept ...	Remington, model 1870...	20	do	do	400		} Springfield...	
	Springfield, model 1870...	20	do	do	400			
	Ward-Burton, model 1870...	20	do	do	400	3		
Dec	Remington, model 1870...	20	1 rear-sight leaf	To load at half-cock	400	2	} Springfield...	
	Springfield, model 1870...	20	1 rear-sight leaf, 1 firing-pin	No remarks	400	1		
	Ward-Burton, model 1870...	20	None reported	do	400	1		
1873.								
Jan	Remington, model 1870...	20	1 stock broken	Should load at half-cock	200	4	} Springfield...	
	Springfield, model 1870...	20	None reported	No remarks	220	2		
	Ward-Burton, model 1870...	20	do	do	200	3		
Feb	Remington, model 1870...	20	do	Should load at half-cock	100		} Springfield...	
	Springfield, model 1870...	20	do	No remarks	200			
	Ward-Burton, model 1870...	20	do	do	100	2		

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.
Remington, model 1870...	20	2 rear-sight leaves, 1 stock		1,320	8
Springfield, model 1870...	20	1 rear-sight leaf, 1 firing-pin		1,840	5
Sharps, model 1870...	20	1 firing-pin		60	
Ward-Burton, model 1870...	20	None reported		1,150	9

Company G, Fourteenth Infantry, Captain David Krause commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870...	20	1 broken—run over by wagon...	To load at half-cock; more force to extractor.	...	...	Springfield...	{ Rear-sights on all arms are too brittle.
	Springfield, model 1870...	19	None reported...	No remarks	...	...		
	Sharps, model 1870...	20	1 tumbler...	do	...	...		
July...	Remington, model 1870...	19	None reported...	To load at half-cock	66	3	Springfield...	
	Springfield, model 1870...	48	do	No remarks	132	4		
	Sharps, model 1870...	17	do	do	66	2	Springfield...	
Aug...	Remington, model 1870...	19	do	To load at half-cock	100	8		
	Springfield, model 1870...	48	1 rear-sight...	No remarks	100	5	Springfield...	
	Sharps, model 1870...	17	None reported...	do	100	5		
Sept...	Remington, model 1870...	19	2 rear-sights...	Firing-pin be made longer	10	3	Springfield...	
	Springfield, model 1870...	47	1 rear-sight...	No remarks	30	...		
	Sharps, model 1870...	17	None reported...	do	10	...		
Oct...	Remington, model 1870...	19	do	Firing-pin be made longer	70	5	Springfield...	
	Springfield, model 1870...	47	do	No remarks	350	23		
	Sharps, model 1870...	17	do	do	80	8	Springfield...	
Nov...	Remington, model 1870...	19	do	Firing-pin be made longer	70	5		
	Springfield, model 1870...	47	do	No remarks	350	28	Springfield...	
	Sharps, model 1870...	17	do	do	80	8		
Dec...	Remington, model 1870...	19	do	Firing-pin be made longer	70	...		
	Springfield, model 1870...	47	do	No remarks	350	14	Springfield...	
	Sharps, model 1870...	17	do	do	80	2		
1872. Jan...	Remington, model 1870...	19	do	Firing-pin be made longer	55	18	Springfield...	
	Springfield, model 1870...	47	do	No remarks	125	8		
	Sharps, model 1870...	17	do	do	20	1		
Feb...	Remington, model 1870...	19	1 breech-block...	Firing-pin be made longer	55	7	Springfield...	{ One trigger catches on the half-cock notch in firing.
	Springfield, model 1870...	47	1 stock; 1 shell stuck in bore...	No remarks	125	8		
	Sharps, model 1870...	17	None reported...	do	20	1		
March...	Remington, model 1870...	19	do	Firing-pin be made longer	80	8	Springfield...	
	Springfield, model 1870...	47	do	No remarks	155	10		
	Sharps, model 1870...	17	do	do	...	...		
April...	Ward-Burton, model 1870...	20	do	do	...	...		
	Remington, model 1870...	17	do	Firing-pin be made longer	80	8	Springfield...	
	Springfield, model 1870...	45	do	No remarks	155	10		
May...	Ward-Burton, model 1870...	20	do	do	...	...		
	Remington, model 1870...	16	do	Firing-pin be made longer	125	10	Springfield...	
	Springfield, model 1870...	44	do	No remarks	265	11		
	Ward-Burton, model 1870...	18	1 stock...	Breech-block liable to damage from dust, sand, &c.	110	7	Springfield...	

Company G, Fourteenth Infantry, Captain David Krause commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872. June...	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	16 43 18	None reported do. do.	Firing-pin be made longer No remarks Breech-block liable to damage from dust, sand, &c.	128 336 136	9 16 8	Springfield...	
July...	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	16 44 18	do. do. do.	Firing-pin be made longer No remarks Breech-block liable to damage from dust, sand, &c.	175 275 150	13 15 15	Springfield...	
Aug...	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	16 44 18	1 friction-spring... 1 firing-pin; 1 broken; 1 lost... None reported	Firing-pin be made longer No remarks Breech-block liable to damage from dust, sand, &c.	135 205 160	13 16 15	Springfield...	
Sept...	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	16 42 18	1 barrel swelled 1 run over by wagon and broken. 1 stock	Firing-pin be made longer No remarks Breech-block liable to damage from dust, sand, &c.	125 245 80	15 16 11	Springfield...	{ Prefers Remington, if improved as suggest- ed.
Oct....	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	16 42 18	None reported 2 stocks	Firing-pin be made longer No remarks	90 320	11 19	Springfield...	1 will not pull off
Nov...	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	16 42 18	None reported 1 mainspring; 1 firing-pin 1 stock	Continually out of order; an unsafe arm. Firing-pin be made longer No remarks	90 110 310	9 10 13	Springfield...	
Dec....	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	14 40 16	None reported 3 rear-sights; 2 firing-pins None reported	Continually out of order; an unsafe arm. Firing-pin be made longer No remarks Continually out of order; an unsafe arm.	80 100 180 140	11 10 8 15	Springfield...	
1873. Jan....	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	14 40 16	do. 2 ejector-springs; 1 rear-sight 1 rear-sight	To load at half-cock; firing-pin to be made longer. No remarks Continually out of order; an unsafe arm.	100 375 100	6 9 7	Springfield...	
Feb....	Remington, model 1870... Springfield, model 1870... Ward-Burton, model 1870.	14 40 16	do. 1 firing-pin; 2 ejector-springs 1 rear-sight	To load at half-cock; firing-pin to be made longer. No remarks Continually out of order; an unsafe arm.	200 380 100	8 12 6	Springfield...	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.			Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	3 rear-sights, 1 breech-block, 1 friction-spring, 1 barrel, 1 mainspring, 1 firing-pin.....			1,944	160
Springfield, model 1870.....	20	4 stocks, 6 rear-sights, 4 ejector-springs, 4 firing-pins.....			4,763	255
Sharps, model 1870.....	20	1 tumbler.....			456	27
Ward-Burton, model 1870.....	20	2 stocks, 2 rear-sights.....			1,146	104

Company H, Fourteenth Infantry, Captain Charles B. Atchison commanding; Sharps rifle-muskets issued March 12, 1873.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873. March	Springfield..... Sharps.....	53 18	None reported..... .....do.....	No remarks..... Shell should be ejected more freely.....	430 140	..... .....	..... } Springfield.....	

Company K, Fourteenth Infantry, Captain G. S. Carpenter commanding; Remington, Springfield, and Sharps rifle-muskets issued April 24, 1871; Ward-Burton rifle-muskets issued March 7, 1872.

1871. May...	Remington, model 1870..	20	None reported.....	Dangerous on account of loading at full-cock.	1,209	13	} Remington ..	
	Springfield, model 1870..	20	do.....	Better fit of breech-screw in receiver; cam-latch cavity less concave.	1,286	10		
June...	Sharps, model 1870.....	20	do.....	Gun-sling is in the way.....	1,333	12	} Remington ..	
	Remington, model 1870..	20	do.....	Dangerous on account of loading at full-cock.	854	7		
July...	Springfield, model 1870..	20	do.....	Better fit of breech-screw in receiver; cam-latch cavity less concave.	575	4	} Remington ..	
	Sharps, model 1870.....	19	do.....	Gun-sling in the way.....	743	7		
	Remington, model 1870..	20	do.....	Dangerous on account of loading at full-cock.	597	4	} Remington ..	
	Springfield, model 1870..	20	do.....	Better fit of breech-screw in receiver; cam-latch cavity less concave.	705	5		
	Sharps, model 1870.....	19	do.....	Gun-sling in the way.....	572	2		

Company K, Fourteenth Infantry, Captain G. S. Carpenter commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Aug . . .	Remington, model 1870 . .	20	None reported	Dangerous on account of loading at full-cock.	550	.....		
	Springfield, model 1870 . .	20	do	Better fit of breech-screw in receiver; cam-latch cavity less concave.	830	.....	Remington . .	{ Rear-sight slides should be made tighter.
	Sharps, model 1870	19	do	Gun-sling in the way	650	.....		
Sept . . .	Remington, model 1870 . .	20	do	The firing-pin should be longer	60	4		
	Springfield, model 1870 . .	20	do	Better fit of breech-screw in receiver; cam-latch cavity less concave.	80	.....	Remington . .	
	Sharps, model 1870	19	do	Gun-sling in the way	40	6		
Oct	Remington, model 1870 . .	20	2 rear-sight leaves	The firing-pin should be longer; should load at half-cock.	260	3	Remington, if modified as suggested.	
	Springfield, model 1870 . .	20	1 rear-sight leaf	Better fit of breech-screw in receiver; cam-latch cavity less concave.	250	.....		
	Sharps, model 1870	19	3 rear-sight leaves, 1 tumbler	Gun-sling in the way	150	25		
Nov	Remington, model 1870 . .	19	None reported	No remarks	650	7		
	Springfield, model 1870 . .	20	do	do	700	.....		
	Sharps, model 1870	19	1 tumbler	do	650	16		
Dec	Remington, model 1870 . .	19	1 shell stuck in the bore	do	450	11		
	Springfield, model 1870 . .	20	do	do	400	4	Remington . .	
	Sharps, model 1870	19	None reported	do	550	13		
1872. Jan	Remington, model 1870 . .	19	1 rear-sight leaf	do	400	24	Remington . .	
	Springfield, model 1870 . .	20	do	do	542	6		
	Sharps, model 1872	19	None reported	do	400	16		
Feb	Remington, model 1870 . .	19	2 rear-sight leaves	do	410	9	Remington . .	
	Springfield, model 1870 . .	20	None reported	do	550	6		
	Sharps, model 1870	19	4 rear-sight leaves	do	450	11		
March . . .	Remington, model 1870 . .	19	1 side-screw	do	152	1	Remington . .	
	Springfield, model 1870 . .	20	None reported	do	101	1		
	Sharps, model 1870	19	do	do	250	5		
	Ward-Burton, model 1870 . .	20	do	do	250	2		
April	Remington, model 1870 . .	19	do	do	200	2	Remington . .	
	Springfield, model 1870 . .	20	do	do	250	3		
	Ward-Burton, model 1870 . .	20	do	do	200	2		
May	Remington, model 1870 . .	19	do	do	200	2	Remington . .	
	Springfield, model 1870 . .	20	do	do	200	2		
	Ward-Burton, model 1870 . .	19	do	do	250	3		
June	Remington, model 1870 . .	19	do	do	250	3	Remington . .	
	Springfield, model 1870 . .	20	do	do	200	2		
	Ward-Burton, model 1870 . .	19	do	do	250	3		

July	Remington, model 1870..	19	do	do	do	300	6	Remington..
	Springfield, model 1870..	20	do	do	do	250	3	
	Ward-Burton, model 1870..	20	do	do	do	325	4	
Aug...	Remington, model 1870..	19	1 rear-sight leaf	do	do	250	3	Remington..
	Springfield, model 1870..	20	do	do	do	275	3	
	Ward-Burton, model 1870..	19	do	do	do	200	2	
Sept...	Remington, model 1870..	19	1 rear-sight slide, 1 rear-sight leaf, 1 rear-sight leaf-screw.	do	do	275	3	
	Springfield, model 1870..	20	1 rear-sight screw, 1 rear-sight leaf, 1 rear-sight slide.	do	do	200	2	Remington..
	Ward-Burton, model 1870..	19	1 rear-sight leaf-screw, 1 rear-sight leaf, 1 sight-slide.	do	do	275	3	
Oct....	Remington, model 1870..	19	1 rear-sight leaf, 1 rear-sight slide.	do	do	300	3	
	Springfield, model 1870..	20	None reported	do	do	175	2	Remington..
	Ward-Burton, model 1870..	19	1 rear-sight leaf, 1 rear-sight slide.	do	do	275	3	
Nov...	Remington, model 1870..	19	1 firing-pin	do	do	300	6	
	Springfield, model 1870..	20	1 ejector-spring	do	do	275	3	Remington..
	Ward-Burton, model 1870..	19	None reported	do	do	200	2	
Dec....	Remington, model 1870..	19	do	do	do	200	2	Remington..
	Springfield, model 1870..	20	do	do	do	350	3	Remington with modifications.
	Ward-Burton, model 1870..	19	do	do	do	250	3	
1873.								
Jan....	Remington, model 1870..	19	1 firing-pin spring	do	do	150	1	Remington..
	Springfield, model 1870..	20	1 mainspring	do	do	200	1	
	Ward-Burton, model 1870..	19	None reported	do	do			
Feb....	Remington, model 1870..	19	1 firing-pin spring	do	do	200	1	Remington..
	Springfield, model 1870..	20	do	do	do	350	1	
	Ward-Burton, model 1870..	19	None reported	do	do	225	1	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870	20	1 side-screw, 8 rear-sight leaves, 2 rear-sight slides, 1 rear-sight leaf-screw, 1 firing-pin springs.	8,217	132
Springfield, model 1870	20	4 rear-sight leaves, 1 rear-sight slide, 1 ejector-spring, 1 rear-sight leaf-screw, 1 mainspring, 1 firing-pin spring.	8,744	68
Sharps, model 1870	20	4 rear-sight leaves, 2 tumblers.	5,788	88
Ward-Burton, model 1870	20	3 rear-sight leaves, 2 rear-sight slides, 1 rear-sight leaf-screw.	2,700	28

Company C, Fifteenth Infantry, Captain H. H. Humphreys commanding; Remington, Springfield, and Sharps rifle-muskets issued May 19, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Aug ...	Remington, model 1870 ..	19	None reported	To load at half-cock	147	19	{ Springfield ...	{ Lieutenant W. T. Hartz commanding.
	Springfield, model 1870 ..	16	do	No remarks	90	3	{	{
	Sharps, model 1870 ..	18	do	do	150	14	{	{
Sept ...	Remington, model 1870 ..	17	do	To load at half-cock	210	9	{ Springfield ..	{ Lieutenant J. W. Bear commanding.
	Springfield, model 1870 ..	17	do	No remarks	186	9	{	{
	Sharps, model 1870 ..	18	do	do	280	17	{	{
Oct. {	Remington, model 1870 ..	17	do	To load at half-cock .....	.....	.....	{ Springfield ...	{ Lieutenant J. W. Eckles commanding.
Nov. {	Springfield, model 1870 ..	17	1 rear-sight	No remarks .....	.....	.....	{	{
	Sharps, model 1870 ..	18	None reported	do .....	.....	.....	{	{
Dec	Remington, model 1870 ..	17	do	To load at half-cock	110	30	{ Springfield ...	{ Lieutenant J. W. Eckles commanding.
	Springfield, model 1870 ..	17	do	No remarks	110	10	{	{
	Sharps, model 1870 ..	18	do	do	110	30	{	{
1872. Jan	Remington, model 1870 ..	17	do	To load at half-cock	90	40	{ Springfield ...	{ Lieutenant J. W. Eckles commanding.
	Springfield, model 1870 ..	17	do	No remarks	90	10	{	{
	Sharps, model 1870 ..	18	do	do	90	40	{	{
Feb	Remington, model 1870 ..	17	do	To load at half-cock	70	5	{ Springfield ...	{ Lieutenant J. W. Eckles commanding.
	Springfield, model 1870 ..	17	do	No remarks	75	.....	{	{
	Sharps, model 1870 ..	18	do	do	75	10	{	{
March ..	Remington, model 1870 ..	17	do	To load at half-cock	55	.....	{ Springfield ...	{ Lieutenant J. W. Eckles commanding.
	Springfield, model 1870 ..	17	do	No remarks	60	.....	{	{
	Sharps, model 1870 ..	18	do	do	55	.....	{	{
April ..	Remington, model 1870 ..	17	do	To load at half-cock .....	.....	.....	{ Springfield ...	{ Lieutenant J. W. Eckles commanding.
	Springfield, model 1870 ..	17	do	No remarks .....	.....	.....	{	{
	Sharps, model 1870 ..	18	do	do .....	.....	.....	{	{
May ...	Remington, model 1870 ..	17	do	To load at half-cock .....	.....	.....	{ Springfield ...	{
	Springfield, model 1870 ..	16	do	No remarks .....	.....	.....	{	{
	Sharps, model 1870 ..	18	do	do .....	.....	.....	{	{
June ...	Remington, model 1870 ..	15	do	To load at half-cock	120	.....	{ Springfield ...	{ Lieutenant J. W. Eckles commanding.
	Springfield, model 1870 ..	17	do	No remarks	120	.....	{	{
	Sharps, model 1870 ..	17	do	do	120	.....	{	{
July ...	Remington, model 1870 ..	14	do	To load at half-cock .....	.....	.....	{ Springfield ...	{ Captain Henry Ellis commanding.
	Springfield, model 1870 ..	16	do	No remarks .....	.....	.....	{	{
	Sharps, model 1870 ..	13	do	do .....	.....	.....	{	{

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870	19	None reported	802	103
Springfield, model 1870	16	1 rear-sight	731	32
Sharps, model 1870	18	None reported	880	111

Company D, Fifteenth Infantry, Captain Horace Jewett commanding; Remington, Springfield, and Sharps rifle-muskets issued May 19, 1871; Ward-Burton rifle-muskets issued March 25, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
July to Dec., in- clusive.	{ Remington, model 1870. Springfield, model 1870. Sharps, model 1870	20	None reported	To load at half-cock			{ Springfield....	{ Lieut. W. T. Hartz com- manding.
1872.		20	do	No remarks	.....	.....		
Jan. and Feb.		20	do	do	do			
March	Remington, model 1870	20	do	To load at half-cock	260	21	{ Springfield....	
	Springfield, model 1870	20	do	No remarks	.....	.....		
	Sharps, model 1870	20	do	do	.....	.....		
April	Remington, model 1870	20	1 barrel	To load at half-cock			{ Springfield....	
	Springfield, model 1870	19	do	No remarks	.....	.....		
	Sharps, model 1870	19	do	do	.....	.....		
May	Remington, model 1870	20	None reported	To load at half-cock			{ Springfield....	
	Springfield, model 1870	19	do	No remarks	.....	.....		
	Sharps, model 1870	19	do	do	.....	.....		
	Ward-Burton, mod. 1870	20	do	do			{ Springfield....	
June	Remington, model 1870	20	do	To load at half-cock	.....	.....		
	Springfield, model 1870	27	do	No remarks	.....	.....		
	Sharps, model 1870	19	do	do			{ Springfield....	
	Ward-Burton, mod. 1870	20	do	do	.....	.....		

Company D, Fifteenth Infantry, Captain Horace Jewett commanding—Continued

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	1 barrel.....	260	21
Springfield, model 1870.....	20	do.....		
Sharps, model 1870.....	20	do.....		
Ward-Burton, model 1870.....	20	None reported.....		

Company B, Sixteenth Infantry, Captain Arthur W. Allyn commanding; Remington, Springfield, and Sharps rifle-muskets issued April 29, 1871; Ward-Burton rifle-muskets issued March 17, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870..	20	None reported.....	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	163	.....		
	Springfield, model 1870..	20	do.....	Thumb piece to have more leverage; too much play to breech-block.	118	2	Sharps.....	
	Sharps, model 1870.....	20	do.....	Lower swivel should be moved higher; should not load with hammer down.	177	1		
July...	Remington, model 1870..	20	1 tang-screw.....	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	85	.....		{ More attention should be given to sighting of arms.
	Springfield, model 1870..	20	None reported.....	Defects noticed in last report disappearing with use.	114	.....	Sharps.....	
	Sharps, model 1870.....	20	do.....	No remarks.....	159	.....		{ Lieut. S. K. Mahon commanding.
Aug...	Remington, model 1870..	18	do.....	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	110	.....		
	Springfield, model 1870..	18	do.....	No remarks.....	80	.....	Remington ..	
	Sharps, model 1870.....	18	do.....	Lower swivel should be moved higher; should not load with hammer down.	80	.....		
Sept...	Remington, model 1870..	18	do.....	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	79	.....		
	Springfield, model 1870..	18	do.....	No remarks.....	89	.....	Sharps.....	
	Sharps, model 1870.....	18	do.....	Lower swivel should be moved higher; should not load with hammer down.	68	.....		

Oct..	17	Remington, model 1870..	do	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	.....	.....	Sharps.....
Nov..	18	Springfield, model 1870..	do	No remarks.....	.....	.....	.....
	17	Sharps, model 1870.....	do	Lower swivel should be moved higher; should not load with hammer down.	.....	.....	.....
	17	Remington, model 1870..	1 mainspring, 1 trigger-spring, 2 firing-pin springs, 2 firing-pin screws.	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	.....	.....	.....
	18	Springfield, model 1870..	2 mainsprings, 1 ejector-spring..	No remarks.....	.....	.....	Sharps.....
	17	Sharps, model 1870.....	1 mainspring, 2 sear-springs.....	Lower swivel should be moved higher; should not load with hammer down.	.....	.....	.....
1872.	17	Remington, model 1870..	None reported	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	.....	.....	.....
Jan....	18	Springfield, model 1870..	do	No remarks.....	.....	.....	Sharps.....
	17	Sharps, model 1870.....	1 tumbler.....	Lower swivel should be moved higher; should not load with hammer down.	.....	.....	.....
March..	17	Remington, model 1870..	None reported	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	.....	.....	.....
	17	Springfield, model 1870..	do	No remarks.....	.....	.....	Springfield...
	17	Sharps, model 1870.....	1 side-screw	Lower swivel should be moved higher; should not load with hammer down.	.....	.....	.....
April..	17	Remington, model 1870..	1 mainspring, 1 rear-sight.....	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	24	1	.....
	17	Springfield, model 1870..	None reported	No remarks.....	43	1	Springfield...
May...	20	Ward-Burton, model 1870..	do	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	49	1	.....
	17	Remington, model 1870..	1 firing-pin.....	No remarks.....	.....	.....	Springfield..
	17	Springfield, model 1870..	None reported	No remarks.....	.....	.....	.....
	20	Ward-Burton, model 1870..	do	Enlarge guard-swivel; to load at half-cock; comb of hammer too short.	33	.....	.....
June...	17	Remington, model 1870..	1 rear-sight	No remarks.....	50	.....	Springfield...
	17	Springfield, model 1870..	None reported	No remarks.....	50	.....	.....
	20	Ward-Burton, model 1870..	do	Enlarge guard swivel; to load at half-cock; comb of hammer too short.	161	.....	.....
July...	17	Remington, model 1870..	1 firing-pin.....	No remarks.....	133	2	Springfield...
	17	Springfield, model 1870..	1 rear-sight, 1 firing-pin, 1 firing-pin spring.	No remarks.....	361	.....	.....
	18	Ward-Burton	None reported	do .....	.....	.....	.....

TOTALS.

Kind of arms.	Orig- nally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, model 1870.....	20	1 tang-screw, 2 mainsprings, 1 trigger-spring, 2 firing-pins, 2 firing-pin springs, 2 firing-pin screws, 2 rear-sights.	655	1
Springfield, model 1870.....	20	2 mainsprings, 1 ejector-spring, 1 rear-sight, 1 firing-pin, 1 firing-pin spring.	627	5
Sharps, model 1870	20	1 mainspring, 1 tumbler, 2 sear-springs, 1 side-screw	482	1
Ward-Burton, model 1870	20	None reported	460	1

Company A, Eighteenth Infantry, Captain Edgar R. Kellogg commanding; Remington, Springfield, and Sharps rifle-muskets issued April 29, 1871; Ward-Burton rifle-muskets issued March 19, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870...	20	None reported	To load at half-cock; more efficient extractor.	150	5		{ Screw heads are too soft. Rear-sight slides are apt to fall down.
	Springfield, model 1870...	20	do	No remarks.	150		Springfield...	
	Sharps, model 1870...	20	1 guard-strap, 1 frame.	do	150	1		
July...	Remington, model 1870...	20	None reported	To load at half-cock; more efficient extractor.				
	Springfield, model 1870...	20	do	No remarks.			Springfield...	
	Sharps, model 1870...	20	do	do				
Aug...	Remington, model 7870...	20	2 rear-sight leaves, 2 rear-sight slides.	To load at half-cock; more efficient extractor.				
	Springfield, model 1870...	20	None reported	No remarks.			Springfield...	
	Sharps, model 1870...	20	1 extractor, 1 firing-bolt, 1 main-spring, 1 tumbler-stirrup.	do				
Sept...	Remington, model 1870...	20	None reported	To load at half-cock; more efficient extractor.			Springfield...	
	Springfield, model 1870...	20	do	No remarks.				
	Sharps, model 1870...	20	1 tumbler.	do			Springfield...	
Oct...	Remington, model 1870...	20	1 firing-pin, 1 firing-pin spring	To load at half-cock; more efficient extractor.				
	Springfield, model 1870...	20	None reported	No remarks.			Springfield...	
	Sharps, model 1870...	20	do	do				
Nov...	Remington, model 1870...	20	1 firing-pin spring	To load at half-cock; more efficient extractor.				
	Springfield, model 1870...	20	1 firing-pin, 1 main-springswivel, 1 ejector-spring.	No remarks.			Springfield...	
	Sharps, model 1870...	20	1 hammer.	do				
Dec...	Remington, model 1870...	20	1 firing-pin, 1 firing-pin spring, 1 rear-sight leaf, 1 rear-sight leaf-slide.	To load at half-cock; more efficient extractor.			Springfield...	
	Springfield, model 1870...	20	1 firing-pin spring	No remarks.				
	Sharps, model 1870...	20	1 tumbler-stirrup, 1 hammer.	do				
1872. Jan...	Remington, model 1870...	20	1 firing-pin spring	To load at half-cock; more efficient extractor.				
	Springfield, model 1870...	20	1 firing-pin spring	No remarks.			Springfield...	
	Sharps, model 1870...	20	1 tumbler, 2 rear-sights, 2 rear-sight slides.	do				

Feb....	Remington, model 1870..	20	None reported	To load at half-cock; more efficient ex- tractor.	.....	.....	Springfield.
March ..	Springfield, model 1870..	20	2 firing-pins.....	No remarks.....	.....	.....	.....
	Sharps, model 1870	20	None reported	do .....	.....	.....	.....
	Remington, model 1870..	20	1 firing-pin.....	To load at half-cock; more efficient ex- tractor.	50	.....	.....
	Springfield, model 1870..	20	2 firing-pins, 1 firing-pin spring..	No remarks.....	70	2	Springfield.
April ..	Sharps, model 1870.....	20	None reported	do	50	.....	.....
	Ward-Burton, model 1870	20	do	Aperture in receiver too narrow for rapid insertion of cartridges.	78	.....	.....
	Remington, model 1870..	20	3 firing-pins, 4 firing-pin springs.	To load at half-cock; more efficient ex- tractor.	90	.....	.....
	Springfield, model 1870..	20	4 firing-pins, 6 firing-pin springs, 2 ejector-springs.	No remarks.....	90	.....	Springfield.
May ...	Ward-Burton, model 1870	20	1 breech-bolt	A dangerous arm in time of war.....	90	6	.....
	Remington, model 1870..	20	1 mainspring.....	Lower gun-swivel should be larger.....	.....	.....	.....
	Springfield, model 1870..	20	2 firing-pins, 2 firing-pin springs, 1 ejector-spring.	No remarks.....	.....	.....	Springfield....
	Ward-Burton, model 1870	20	None reported	A dangerous arm in time of war.....	.....	.....	.....
June...	Remington, model 1870..	20	1 mainspring, 1 firing-pin, 1 firing- pin spring.	Lower gun-swivel should be larger.....	.....	.....	.....
	Springfield, model 1870..	20	1 firing-pin, 2 firing-pin springs ..	No remarks.....	.....	.....	Springfield ..
	Ward-Burton, model 1870	20	1 locking-bolt spring.....	A dangerous arm in time of war .....	.....	.....	.....
	Remington, model 1870..	20	1 mainspring, 1 rear-sight, 1 firing- pin, 2 firing-pin springs.	Lower gun-swivel should be larger.....	.....	.....	.....
July ...	Springfield, model 1870..	20	1 firing-pin.....	No remarks.....	.....	.....	Springfield ..
	Ward-Burton, model 1870	20	1 locking-bolt spring.....	A dangerous arm in time of war .....	.....	.....	.....
	Remington, model 1870..	20	1 mainspring, 2 firing-pin springs, 1 firing-pin.....	Lower gun-swivel should be larger.....	.....	.....	.....
	Ward-Burton, model 1870	20	None reported	No remarks.....	.....	.....	Springfield ..
Aug ...	Remington, model 1870..	20	1 firing-pin.....	A dangerous arm in time of war.....	.....	.....	.....
	Springfield, model 1870..	20	1 firing-pin.....	No remarks.....	.....	.....	.....
	Ward-Burton, model 1870	20	1 firing-pin.....	A dangerous arm in time of war.....	.....	.....	.....
	Remington, model 1870..	20	1 firing-pin.....	No remarks.....	.....	.....	.....

TOTALS.

Kind of arms.	Orig- inally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, model 1870	20	1 rear-sight, 3 rear-sight leaves, 3 rear-sight leaf-slides, 9 firing-pins, 15 firing-pin springs, 4 mainsprings.	290	5
Springfield, model 1870.....	20	1 mainspring-swivel, 14 firing-pins, 13 firing-pin springs, 4 ejector-springs	310	2
Sharps, model 1870.....	20	1 guard-strap, 1 receiver, 1 extractor, 1 firing-bolt, 1 mainspring, 2 tumbler-stirrups, 2 tumblers, 2 hammers, 2 rear-sights, 2 rear-sight slides.	200	1
Ward-Burton, model 1870	20	1 breech-bolt, 2 locking-bolt springs.....	168	6

Company E, Eighteenth Infantry, Captain Jacob Kline commanding; Remington, Springfield, and Sharps rifle-muskets issued April 29, 1871; Ward-Burton rifle-muskets issued March 19, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. May ...	Remington, model 1870..	20	1 firing-pin spring, 1 ejector- spring.	To load at half-cock.....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	None reported	No remarks.....	.....	.....		
	Sharps, model 1870.....	20	do	do .....	.....	.....		
June...	Remington, model 1870..	20	1 firing-pin 1 extractor	To load at half-cock.....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	None reported	No remarks.....	.....	.....		
	Sharps, model 1870.....	20	2 firing-pins.....	do .....	.....	.....		
Aug ...	Remington, model 1870..	20	None reported	To load at half-cock.....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	do	No remarks.....	.....	.....		
	Sharps, model 1870.....	20	do	do .....	.....	.....		
Sept ...	Remington, model 1870..	20	do	To load at half-cock.....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	do	No remarks.....	.....	.....		
	Sharps, model 1870.....	20	1 tip-stock	do .....	.....	.....		
Oct ...	Remington, model 1870..	20	1 stock	To load at half-cock.....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	None reported	No remarks.....	.....	.....		
	Sharps, model 1870.....	20	do	Gun-sling in the way.....	.....	.....		
Nov ...	Remington, model 1870..	20	Quite a number of firing-pins.....	Difficult to extract the shells.....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	do	No remarks.....	.....	.....		
	Sharps, model 1870.....	20	None reported	Difficult to extract the shells.....	.....	.....		
Dec... { 1872. { Feb... { March .	Remington, model 1870..	20	do	do .....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	do	No remarks.....	.....	.....		
	Sharps, model 1870.....	20	do	Difficult to extract the shells.....	.....	.....		
	Remington, model 1870..	20	do	do .....	.....	.....		
	Springfield, model 1870..	20	do	No remarks.....	.....	.....	Springfield ..	
	Sharps, model 1870.....	20	do	Difficult to extract the shells.....	.....	.....		
April ..	Ward-Burton, model 1870	20	do	No remarks.....	.....	.....	Springfield ..	
	Remington, model 1870..	19	do	Difficult to extract the shells.....	.....	.....		
	Springfield, model 1870..	20	do	No remarks.....	.....	.....		
	Ward-Burton, model 1870	20	do	do .....	.....	.....		
May ...	Remington, model 1870..	20	1 rear-sight	Difficult to extract the shells.....	.....	.....	Springfield ..	
	Springfield, model 1870..	20	None reported	No remarks.....	.....	.....		
	Ward-Burton, model 1870	20	do	do .....	.....	.....		
	Remington, model 1870..	20	do	Difficult to extract the shells.....	.....	.....	Springfield ..	
June { July {	Springfield, model 1870..	20	do	No remarks.....	.....	.....		
	Ward-Burton, model 1870	20	do	The locking-bolt becomes loose in going through the manual.	.....	.....		
Sept ...	Remington, model 1870..	20	do	Difficult to extract shells.....	.....	.....	Springfield...	
	Springfield, model 1870..	20	3 firing-pins.....	No remarks.....	.....	.....		
	Ward-Burton, model 1870	20	None reported	The locking-bolt becomes loose in going through the manual.	.....	.....		

Nov ...	Remington, model 1870..	20	1 rear-sight	Difficult to extract shells.....	.....	.....	.....	Springfield..
	Springfield, model 1870..	20	None reported	No remarks .....	.....	.....	.....	.....
	Ward-Burton, model 1870	20	do	The locking-bolt becomes loose in going through the manual.	.....	.....	.....	.....
Dec....	Remington, model 1870..	20	do	Difficult to extract shells.....	.....	.....	.....	.....
	Springfield, model 1870..	20	do	No remarks .....	.....	.....	.....	.....
	Ward-Burton, model 1870	20	do	The locking-bolt becomes loose in going through the manual.	.....	.....	.....	Springfield..
1873.	Remington, model 1870..	20	do	No remarks .....	.....	.....	.....	.....
Jan	Springfield, model 1870..	20	do	do .....	.....	.....	.....	.....
	Ward-Burton, model 1870	20	do	do .....	.....	.....	.....	Springfield..

TOTALS.

Kind of arms.		Originally issued.	Broken parts belonging to the system.				Cartridges fired.	Cartridges failed.
Remington, model 1870.....	.....	20	1 firing-pin spring, 1 ejector-spring, 1 stock, 1 firing-pin, 1 extractor, 2 rear-sights.....	.....	.....	.....	.....	.....
Springfield, model 1870.....	.....	20	3 firing-pins .....	.....	.....	.....	.....	.....
Sharps, model 1870 .....	.....	20	2 firing-pins, 1 stock .....	.....	.....	.....	.....	.....
Ward-Burton, model 1870.....	.....	20	None reported.....	.....	.....	.....	.....	.....

Company K, Eighteenth Infantry, Captain James Stewart commanding; Sharps rifle-muskets issued April 13, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873. March ..	Springfield, model 1870..	40	None reported	No remarks .....	.....	.....	.....	.....
	Sharps, model 1870	20	do	do .....	.....	.....	} Springfield...	.....

Company D, Twenty-third Infantry, Captain T. M. K. Smith commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

1871. July ...	Remington, model 1870 ..	20	None reported	No remarks .....	.....	.....	.....	.....
	Springfield, model 1870..	20	do	do .....	.....	.....	.....	.....
	Sharps, model 1870	20	do	do .....	.....	.....	.....	.....

Company D, Twenty-third Infantry, Captain T. M. K. Smith commanding—Continued.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Sept...	Remington, model 1870...	20	None reported	To load at half cock.	...	...	} Springfield...	
	Springfield, model 1870...	20	do	No remarks.	...	...		
	Sharps, model 1870	20	do	Gun-sling in the way	...	...		
Dec...	Remington, model 1870...	20	do	No remarks.	...	...	} Springfield...	
	Springfield, model 1870...	90	do	do	...	...		
	Sharps, model 1870	20	do	do	...	...		
1872. April...	Remington, model 1870...	20	1 ejector-spring, 3 rear-sights	To load at half-cock; more powerful ejector	206	4	} Springfield...	
	Springfield, model 1870...	20	None reported	No remarks.	214	3		
	Sharps, model 1870	20	do	More powerful ejector	12	...		
May...	Remington, model 1870...	20	do	No remarks.	27	...	} Springfield...	
	Springfield, model 1870...	20	do	do	12	...		
	Sharps, model 1870	20	do	do	3	...		
June...	Remington, model 1870...	20	do	do	...	...	} Springfield...	
	Springfield, model 1870...	20	do	do	...	...		
	Sharps, model 1870	20	do	do	...	...		
TOTALS.								
Kind of arms.			Orig- inally issued.	Broken parts belonging to the system.			Cartridges fired.	Car- tridges failed.
Remington, model 1870...			20	1 ejector-spring, 3 rear-sights.			233	4
Springfield, model 1870...			20	None reported			226	3
Sharps, model 1870			20	do			15	.....

Company E, Twenty-third Infantry, Captain George K. Brady commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
July ...	Remington, model 1870...	20	None reported	To load at half-cock	...	...	Springfield...	{ The screws of all the arms are made of poor material.
	Springfield, model 1870...	20	do	No remarks	...	...	Springfield...	
	Sharps, model 1870	20	do	do	...	...	Springfield...	
Aug ...	Remington, model 1870...	20	do	Does not eject shells	66	8	Springfield...	
	Springfield, model 1870...	20	do	No remarks	60	7	Springfield...	
	Sharps, model 1870	20	do	do	99	9	Springfield...	
Sept ...	Remington, model 1870...	20	do	Does not eject shells	57	5	Springfield...	
	Springfield, model 1870...	20	do	No remarks	42	2	Springfield...	
	Sharps, model 1870	20	do	do	44	4	Springfield...	
Oct	Remington, model 1870...	20	do	Does not eject shells	27	2	Springfield...	
	Springfield, model 1870...	20	do	No remarks	36	2	Springfield...	
	Sharps, model 1870	20	do	do	30	3	Springfield...	
Nov	Remington, model 1870...	20	do	Does not eject shells	24	1	Springfield...	{ Lieut. R. H. Poillon commanding.
	Springfield, model 1870...	20	do	No remarks	45	7	Springfield...	
	Sharps, model 1870	20	do	Too clumsy for troops to handle	48	3	Springfield...	
Dec	Remington, model 1870...	20	do	Does not eject shells	...	...	Springfield...	
	Springfield, model 1870...	20	do	No remarks	...	...	Springfield...	
	Sharps, model 1870	20	do	Too clumsy for troops to handle	...	...	Springfield...	
1872.								
Jan	Remington, model 1870...	20	1 barrel, 1 stock damaged	Does not eject shells	...	...	Springfield...	
	Springfield, model 1870...	20	None reported	No remarks	...	...	Springfield...	
	Sharps, model 1870	20	1 lever	Too clumsy for troops to handle	...	...	Springfield...	
Feb	Remington, model 1870...	20	None reported	Does not eject shells	30	2	Springfield...	
	Springfield, model 1870...	20	do	No remarks	36	4	Springfield...	
	Sharps, model 1870	20	do	Too clumsy for troops to handle	33	3	Springfield...	
March...	Remington, model 1870...	20	1 broken accidentally by team	Too clumsy for troops to handle	...	...	Springfield...	
	Springfield, model 1870...	20	None reported	No remarks	...	...	Springfield...	
	Sharps, model 1870	20	do	do	...	...	Springfield...	
April ..	Remington, model 1870...	20	do	do	...	...	Springfield...	
	Springfield, model 1870...	20	do	do	...	...	Springfield...	
	Sharps, model 1870	19	do	do	...	...	Springfield...	
May ...	Remington, model 1870...	20	do	do	...	...	Springfield...	
	Springfield, model 1870...	20	do	do	...	...	Springfield...	
	Sharps, model 1870	18	do	do	...	...	Springfield...	
June...	Remington, model 1870...	20	do	do	...	...	Springfield...	
	Springfield, model 1870...	20	do	do	...	...	Springfield...	
	Sharps, model 1870	18	do	do	...	...	Springfield...	
Dec	Ward-Burton, model 1870	20	1 lever	do	130	20	Springfield...	
			None reported	do	...	...	Springfield...	

Company E, Twenty-third Infantry, Captain George K. Brady commanding—Continued.

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	1 barrel, 1 stock.....	204	18
Springfield, model 1870.....	20	None reported.....	219	22
Sharps, model 1870.....	20	2 levers.....	254	22
Ward-Burton, model 1870.....	20	None reported.....	.....	.....

Company I, Twenty-third Infantry, Captain George M. Randall commanding; Remington, Springfield, and Sharps rifle-muskets issued June 2, 1871; Ward-Burton rifle-muskets issued June 7, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. June...	Remington, model 1870...	20	None reported.....	No remarks.....	61	8	.....	.....
	Springfield, model 1870...	20	do.....	do.....	61	8	.....	.....
	Ward-Burton, model 1870...	20	do.....	do.....	61	4	.....	.....
Sept...	Remington, model 1870...	20	do.....	do.....	168	7	.....	.....
	Springfield, model 1870...	20	1 stock.....	do.....	166	7	.....	.....
	Ward-Burton, model 1870...	20	do.....	do.....	166	4	.....	.....
Dec....	Remington, model 1870...	20	None reported.....	do.....	.....	.....	.....	.....
	Springfield, model 1870...	19	1 stock.....	do.....	.....	.....	.....	.....
	Ward-Burton, model 1870...	19	do.....	do.....	.....	.....	.....	.....

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	None reported.....	229	15
Springfield, model 1870.....	20	2 stocks.....	227	15
Ward-Burton, model 1870.....	20	do.....	227	8

Company E, Twenty-fourth Infantry, Captain J. W. Clous commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of re- port.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements sug- gested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871. Aug . . .	Remington, model 1870 . . . Springfield, model 1870 . . . Sharps, model 1870 . . .	20 20 20	1 rear-sight, 1 rear-sight slide . . . None reported . . . 3 levers . . .	No remarks . . . do . . . The swivel to be removed above the lever . . .	10 10 15		} Springfield. . . .	
Sept . . .	Remington, model 1870 . . . Springfield, model 1870 . . . Sharps, model 1870 . . .	20 20 20	None reported . . . do . . . do . . .	No remarks . . . do . . . do . . .	177		} Springfield. . . .	
Dec. . . .	Remington, model 1870 . . . Springfield, model 1870 . . . Sharps, model 1870 . . .	20 20 20	1 stock . . . None reported . . . do . . .	do . . . do . . . do . . .	70 60 80	7 3 13	} Springfield. . . .	
1872. Jan	Remington, model 1870 . . . Springfield, model 1870 . . . Sharps, model 1870 . . .	20 20 20	do . . . do . . . do . . .	do . . . do . . . do . . .				} Lieutenant J. L. Bullis commanding.
Feb. . . .	Remington, model 1870 . . . Springfield, model 1870 . . . Sharps, model 1870 . . .	20 20 18	do . . . do . . . do . . .	do . . . do . . . do . . .			} Springfield . . .	
March . .	Remington, model 1870 . . . Springfield, model 1870 . . . Sharps, model 1870 . . .	20 20 18	1 rear-sight, 1 rear-sight slide, 1 extractor. 1 rear-sight leaf-slide . . . 2 rear-sights lost . . .	do . . . do . . . do . . .	77 70 70	14 2 8	} Springfield . . .	

TOTALS.

Kind of arms.	Orig- inally issued.	Broken parts belonging to the system.	Cartridges fired.	Car- tridges failed.
Remington, model 1870 . . . Springfield, model 1870 . . . Sharps, model 1870 . . .	20 20 20	1 stock, 2 rear-sights, 2 rear-sight slides, 1 extractor . . . 1 rear-sight slide . . . 3 levers . . .	157 217 165	18 5 21

Company A, Twenty-fifth Infantry, Captain John W. French commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Sept . . .	Remington, model 1870 . . .	20	None reported . . .	No remarks . . .	100		} Springfield . . .	{ Lieut. A. Geddes commanding.
	Springfield, model 1870 . . .	20	2 rear-sight leaves . . .	do . . .	100	.....		
	Sharps, model 1870 . . .	20	None reported . . .	Gun-swivel in the way . . .	100	.....		
Dec . . .	Remington, model 1870 . . .	19	1 rear-sight leaf . . .	Too complicated; heavy and less convenient than Springfield.	300	2		
	Springfield, model 1870 . . .	19	do . . .	No remarks . . .			} Springfield . . .	{ Lieut. A. Geddes commanding.
	Sharps, model 1870 . . .	19	None reported . . .	The cartridge has to be forced home with the thumb.	.....	.....		
1872.								
Feb . . .	Remington, model 1870 . . .	20	1 stock . . .	Too complicated; heavy and less convenient than Springfield.			} Springfield . . .	{
	Springfield, model 1870 . . .	20	1 rear-sight . . .	No remarks . . .	.....	.....		
	Sharps, model 1870 . . .	20	1 bridle . . .	The cartridge has to be forced home with the thumb.			} Springfield . . .	{ Cartridges fail in Sharps which go in Springfield.
March .	Remington, model 1870 . . .	20	None reported . . .	No remarks . . .	650	1		
	Springfield, model 1870 . . .	19	do . . .	do . . .	.....	.....		
	Sharps, model 1870 . . .	20	do . . .	do . . .	.....	.....		
April . .	Remington, model 1870 . . .	19	do . . .	do . . .			} Springfield . . .	{
	Springfield, model 1870 . . .	18	do . . .	do . . .	.....	.....		
	Sharps, model 1870 . . .	19	1 lever . . .	do . . .			} Springfield . . .	{
May . . .	Remington, model 1870 . . .	19	None reported . . .	do . . .	.....	.....		
	Springfield, model 1870 . . .	19	do . . .	do . . .			} Springfield . . .	{
	Sharps, model 1870 . . .	18	1 lever . . .	do . . .	.....	.....		
	Ward-Burton, model 1870 . . .	19	None reported . . .	do . . .			} Springfield . . .	{
June . . .	Remington, model 1870 . . .	19	do . . .	do . . .	.....	.....		
	Springfield, model 1870 . . .	17	do . . .	Prefers Springfield over Remington and Sharps for strength of stock, rapidity of fire, ejection of shells, and ability to stand rough usage; over Ward-Burton for strength of breech-loading parts and safety.			} Springfield . . .	{
	Sharps, model 1870 . . .	20	do . . .	No remarks . . .	100	.....		
	Ward-Burton, model 1870 . . .	19	do . . .	do . . .			} Springfield . . .	{
July . . .	Remington, model 1870 . . .	18	do . . .	do . . .	.....	.....		
	Springfield, model 1870 . . .	17	do . . .	do . . .			} Springfield . . .	{
	Sharps, model 1870 . . .	19	do . . .	do . . .	.....	.....		
	Remington, model 1870 . . .	18	do . . .	do . . .			} Springfield . . .	{
Sept . . .	Springfield, model 1870 . . .	17	do . . .	do . . .	.....	.....		
	Sharps, model 1860 . . .	3	do . . .	do . . .			} Springfield . . .	{
	Ward-Burton, model 1870 . . .	19	do . . .	do . . .	52	.....		

TOTALS.

Kind of arms.	Origt-nally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870.....	20	1 stock, 1 rear-sight leaf.....	400	2
Springfield, model 1870.....	20	1 rear-sight, 3 rear-sight leaves.....	100	.....
Sharps, model 1870.....	20	1 bridle, 2 levers.....	100	.....
Ward-Burton, model 1870.....	20	None reported.....	.....	.....

Company G, Twenty-fifth Infantry, Captain J. H. Patterson commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward-Burton rifle-muskets issued May 1, 1872.

Date of re-.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Oct....	Remington, model 1870..	20	None reported.....	No remarks.....	.....	.....	.....	.....
	Springfield, model 1870..	20	do.....	do.....	.....	.....	Springfield...	.....
	Sharps, model 1870.....	20	do.....	do.....	.....	.....	.....	.....
	Remington, model 1870..	20	1 rear-sight.....	To load at half-cock.....	80	6	.....	.....
	Springfield, model 1870..	20	None reported.....	No remarks.....	80	3	Springfield...	.....
	Sharps, model 1870.....	20	1 tumbler.....	Gun-sling in the way.....	80	6	.....	.....
	Remington, model 1870..	20	None reported.....	Dangerous in two-rank formations.....	150	6	.....	.....
	Springfield, model 1870..	20	do.....	No remarks.....	150	1	Springfield...	.....
	Sharps, model 1870.....	20	do.....	Fails to eject the shells.....	150	10	.....	.....
1872.								
Jan....	Remington, model 1870..	20	do.....	The sights of all arms should have a friction-spring or set-screw.	175	.....	Springfield...	.....
	Springfield, model 1870..	20	do.....	.....	200	.....	.....	.....
	Sharps, model 1870.....	20	do.....	.....	167	3	.....	.....
	Remington, model 1870..	20	1 rear-sight.....	.....	225	8	.....	.....
	Springfield, model 1870..	20	1 stock.....	.....	242	8	Springfield...	.....
	Sharps, model 1870.....	20	do.....	.....	249	12	.....	.....
March..	Remington, model 1870..	20	None reported.....	No remarks.....	630	14	.....	.....
	Springfield, model 1870..	20	do.....	do.....	767	15	Springfield...	.....
	Sharps, model 1870.....	20	do.....	do.....	727	31	.....	.....
	Remington, model 1870..	20	do.....	do.....	19	.....	.....	.....
	Springfield, model 1870..	20	do.....	do.....	17	.....	Springfield...	.....
	Sharps, model 1870.....	20	do.....	do.....	20	2	.....	.....
April...	Remington, model 1870..	20	do.....	do.....	130	2	.....	.....
	Springfield, model 1870..	20	do.....	do.....	140	3	Springfield...	.....
	Sharps, model 1870.....	20	do.....	do.....	138	6	.....	.....
May....	Remington, model 1870..	20	do.....	do.....	.....	.....	.....	.....
	Springfield, model 1870..	20	do.....	do.....	.....	.....	.....	.....
	Sharps, model 1870.....	20	do.....	do.....	.....	.....	.....	.....

Company G, Twenty-fifth Infantry, Captain J. H. Patterson commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1872 June...	Remington, model 1870...	20	None reported	No remarks.	21	2		
	Springfield, model 1870...	20	do	do	27	3	Springfield...	
	Sharps, model 1870	20	do	do	19			
	Ward-Burton, model 1870	20	do	do				
July...	Remington, model 1870...	20	do	do	135	5		
	Springfield, model 1870...	20	do	do	198	7	Springfield...	
	Ward-Burton, model 1870	20	do	do	120	6		
Aug...	Remington, model 1870...	19	do	do				
	Springfield, model 1870...	19	do	do				
	Ward-Burton, model 1870	19	do	do				
Sept...	Remington, model 1870...	20	1 stock, 1 side-screw	The sights of all arms should have a friction-spring or set-screw.	206	9		
	Springfield, model 1870...	20	1 rear-sight leaf		195	6	Springfield...	
	Ward-Burton, model 1870	19	None reported		275	11		
Oct...	Remington, model 1870...	18	1 side-screw, 4 rear sight leaves.	No remarks.				
	Springfield, model 1870...	19	1 rear-sight	do				
	Ward-Burton, model 1870	18	None reported	do				
TOTALS.								
Kind of arms.			Originally issued.	Broken parts belonging to the system.		Cartridges fired.	Cartridges failed.	
Remington, model 1870			20	4 rear-sight leaves, 1 stock, 2 side-screws, 2 rear-sights.		1,771	52	
Springfield, model 1870			20	1 stock, 1 rear-sight leaf, 1 rear-sight.		2,016	43	
Sharps, model 1870			20	1 stock, 1 tumbler.		1,550	73	
Ward-Burton, model 1870			20	None reported		395	17	

Company I, Twenty-fifth Infantry, Captain Gaines Lawson commanding; Remington, Springfield, and Sharps rifle-muskets issued July 17, 1871; Ward Burton rifle-muskets issued May 1, 1872.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1871.								
Aug . . .	Remington, model 1870 . .	20	None reported	No remarks	7	...	Springfield . . .	
	Springfield, model 1870 . .	20	do	do	7	...	Springfield . . .	
	Sharps, model 1870	20	do	do	7	...	Springfield . . .	
Sept . . .	Remington, model 1870 . .	20	do	do	340	...	Springfield . . .	
	Springfield, model 1870 . .	20	do	do	340	...	Springfield . . .	
	Sharps, model 1870	20	do	do	340	1	Springfield . . .	
Oct	Remington, model 1870 . .	20	do	do	225	...	Springfield . . .	
	Springfield, model 1870 . .	20	do	do	225	...	Springfield . . .	
	Sharps, model 1870	20	do	do	225	...	Springfield . . .	
Nov	Remington, model 1870 . .	20	do	do	116	...	Springfield . . .	
	Springfield, model 1870 . .	20	do	do	116	...	Springfield . . .	
	Sharps, model 1870	19	do	do	116	...	Springfield . . .	
Dec	Remington, model 1870 . .	20	do	do	23	...	Springfield . . .	
	Springfield, model 1870 . .	20	do	do	23	...	Springfield . . .	
	Sharps, model 1870	19	do	do	19	...	Springfield . . .	
			1 lever	do				
1872.								
Jan	Remington, model 1870 . .	20	1 stock	do	10	...	Springfield . . .	
	Springfield, model 1870 . .	19	None reported	do	10	...	Springfield . . .	
	Sharps, model 1870	20	do	do	10	...	Springfield . . .	
Feb	Remington, model 1870 . .	20	do	do	50	...	Springfield . . .	
	Springfield, model 1870 . .	18	do	do	50	...	Springfield . . .	
	Sharps, model 1870	20	do	do	50	...	Springfield . . .	
March . . .	Remington, model 1870 . .	20	1 lever	do			Springfield . . .	
	Springfield, model 1870 . .	20	None reported	do			Springfield . . .	
	Sharps, model 1870	18	do	do			Springfield . . .	
	Remington, model 1870 . .	20	do	do			Springfield . . .	
	Springfield, model 1870 . .	20	do	do			Springfield . . .	
	Sharps, model 1870	20	do	do			Springfield . . .	
April . . .	Remington, model 1870 . .	20	do	do			Springfield . . .	
May . . .	Springfield, model 1870 . .	17	do	do			Springfield . . .	
	Sharps, model 1870	20	do	do			Springfield . . .	
June	Remington, model 1870 . .	19	do	do			Springfield . . .	
	Springfield, model 1870 . .	17	do	do			Springfield . . .	
	Ward-Barton, model 1870 . .	18	do	do			Springfield . . .	
	Remington, model 1870 . .	18	do	do			Springfield . . .	
	Springfield, model 1870 . .	18	do	do			Springfield . . .	
	Ward-Barton, model 1870 . .	17	do	do			Springfield . . .	
July	Remington, model 1870 . .	18	do	do			Springfield . . .	
Aug	Springfield, model 1870 . .	17	do	do			Springfield . . .	
Sept	Ward-Barton, model 1870 . .	18	do	do			Springfield . . .	
	Remington, model 1870 . .	17	2 stocks	do			Springfield . . .	
	Springfield, model 1870 . .	17	None reported	do			Springfield . . .	
	Ward-Barton, model 1870 . .	18	do	do			Springfield . . .	
	Remington, model 1870 . .	18	do	do			Springfield . . .	
	Springfield, model 1870 . .	18	do	do			Springfield . . .	
	Ward-Barton, model 1870 . .	18	do	do			Springfield . . .	
	Remington, model 1870 . .	18	do	do	60		Springfield . . .	
	Springfield, model 1870 . .	18	do	do	100		Springfield . . .	
	Ward-Barton, model 1870 . .	18	do	do	40		Springfield . . .	

Company I, Twenty-fifth Infantry, Captain Gaines Lawson commanding—Continued.

Date of report.	Kind of arms.	On hand.	Broken parts.	Modifications and improvements suggested.	Cartridges fired.	Cartridges failed.	Preference.	Remarks.
1873.								
Jan	Remington, model 1870..	18	None reported	No remarks . . . . .	.....	.....	.....	
	Springfield, model 1870..	18	do	do . . . . .	.....	.....	} Springfield	
	Ward-Burton, model 1870	18	do	do . . . . .	.....	.....	.....	
	Remington, model 1870..	17	do	do . . . . .	.....	.....	} Springfield	
Feb	Springfield, model 1870..	18	do	do . . . . .	.....	.....	.....	
	Ward-Burton, model 1870	18	do	do . . . . .	.....	.....	.....	

TOTALS.

Kind of arms.	Originally issued.	Broken parts belonging to the system.	Cartridges fired.	Cartridges failed.
Remington, model 1870..	20	3 stocks	831	.....
Springfield, model 1870..	20	None reported	871	.....
Sharps, model 1870..	20	2 levers	767	1
Ward-Burton, model 1870..	20	None reported	40	.....

STRAC

NGFI

Stock

Company I, Twenty-fifth Infantry, Captain Gaines Lawson commanding—Continued.

B-ABSTRAC

SPRINGFIRAC

BUR	
No. of eports.	Stock
16	recei ers.
5	
17	
13	
3	
8	
10	
2	
1	
1	
1	
15	
8	
7	
1	
4	
6	
1	
3	
14	
1	
1	
1	
21	
10	
19	
1	
18	
14	
14	
12	
12	
18	
19	
6	
5	
19	
11	
5	
Eleventh Infantry	
Twelfth Infantry	
Thirteenth Infantry	
Fourteenth Infantry	
Fifteenth Infantry	
Sixteenth Infantry	
Eighteenth Infantry	
Twenty-third Infa	
Twenty-fourth In	
Twenty-fifth Infa	
Total.	
Parts broken per	
1,828 guns	
Parts broken per	
1,000 reports . .	

1,882

8
3
24
65
681
1
0
1
40
9
16
3
0
13
5
6
0
5
5
255
0
68
32
0
0
0
2
0
0
0
3
22
15
5
0
43
0

T—Continued.

LB.

Principal parts broken.					Cartridges fired.	Cartridges failed.
S.	Receiv- ers.	Breech- blocks.	Main- springs.	Extract- ors.		
3			1	.....	2, 100	47
3					370	0
3					1, 340	78
3			3	.....	48	0
9					225	19
9					900	25
9		1	.....	.....	1, 915	65
9					321	3
9					120	5
9					125	7
9					50	1
9					1, 732	19
9					661	25
9					0	0
9					40	0
9					271	3
9					225	0
9					177	13
9					538	6
9					2, 281	16
9					0	0
9					60	0
9					0	0
9					7, 524	25
9					3, 916	0
9			1	.....	2, 803	0
9					0	0
9					0	0
9				1	1, 726	14
9					0	0
9					1, 115	0
9					3, 186	34
9					729	1
9					669	0
9					616	39
9					876	30
9					4, 515	34
9					2, 100	0
9					731	30
9					321	0
9					2, 045	5
9					310	8

VARD-BUR

[illegible]

9

2

1

4

Total.....*970

Fourteenth Infant	0
9	
104	
28	
0	
1	Sixteenth Infant
6	Eighteenth Infant
0	
0	
0	Twenty-third Infant
8	
0	Twenty-fifth Infant
17	
0	

下

T—Continued.

TON.

P principal parts broken.

V.	Principal parts broken.				Cartridges fired.	Cartridges failed.
	Bolts.	Main- springs.	Extract- ors.	Upper guard- screws.		
					200	0
					455	9
					84	10
					425	37
					910	53
				2	120	5
					400	100
					125	6
					885	37
					113	6
					538	20
					1,135	5
					0	0
					50	4
				1	6,120	12
	5			5	1,090	5
					0	0
					640	11
					0	0
	1	1			300	0
	1				1,170	12
					217	1
					0	0
	1				265	12
	2				3,780	54
					0	0
					400	80
	1				1,400	6
					180	12
	1	3	2	1	783	65
					0	0
		1		1	525	20
					850	95
					1,329	76
				2	477	7
					42	10
					503	4
					1,922	9
					1,500	0
					1,376	10

(C.)—RECAPITULATION.

	Remington.	Springfield.	Sharps.	Ward-Burton.
Number of arms originally issued and reported on	1,502	1,828	2,470	1,039
Number of monthly reports rendered	810	814	584	334
Last expression of preference by officers commanding companies	10	84	1	0
Proportionate number of principal parts broken, as by 1,000 guns in 1,000 months.	Stocks	21.0	21.0	58.0
	Receivers	0.0	0.69	0.0
	Blocks or bolts	0.67	0.69	49.0
	Mainsprings	6.0	8.0	14.0
	Extractors	0.67	0.69	6.0
	Lever .....	.....	13.0	.....
	Upper guard-screws .....	.....	.....	35.0
Total	66.82	28.34	44.07	162.0
Number of cartridges fired	89,828	96,479	76,628	40,070
Number of cartridges failed	2,595	1,882	2,699	970
Percentage of misfires	0.0288	0.0196	0.0352	0.0242

Page	Chapter	Section	Page	Section	Page
1	I	1	1	1	1
2	I	2	2	2	2
3	I	3	3	3	3
4	I	4	4	4	4
5	I	5	5	5	5
6	I	6	6	6	6
7	I	7	7	7	7
8	I	8	8	8	8
9	I	9	9	9	9
10	I	10	10	10	10
11	I	11	11	11	11
12	I	12	12	12	12
13	I	13	13	13	13
14	I	14	14	14	14
15	I	15	15	15	15
16	I	16	16	16	16
17	I	17	17	17	17
18	I	18	18	18	18
19	I	19	19	19	19
20	I	20	20	20	20
21	I	21	21	21	21
22	I	22	22	22	22
23	I	23	23	23	23
24	I	24	24	24	24
25	I	25	25	25	25
26	I	26	26	26	26
27	I	27	27	27	27
28	I	28	28	28	28
29	I	29	29	29	29
30	I	30	30	30	30
31	I	31	31	31	31
32	I	32	32	32	32
33	I	33	33	33	33
34	I	34	34	34	34
35	I	35	35	35	35
36	I	36	36	36	36
37	I	37	37	37	37
38	I	38	38	38	38
39	I	39	39	39	39
40	I	40	40	40	40
41	I	41	41	41	41
42	I	42	42	42	42
43	I	43	43	43	43
44	I	44	44	44	44
45	I	45	45	45	45
46	I	46	46	46	46
47	I	47	47	47	47
48	I	48	48	48	48
49	I	49	49	49	49
50	I	50	50	50	50
51	I	51	51	51	51
52	I	52	52	52	52
53	I	53	53	53	53
54	I	54	54	54	54
55	I	55	55	55	55
56	I	56	56	56	56
57	I	57	57	57	57
58	I	58	58	58	58
59	I	59	59	59	59
60	I	60	60	60	60
61	I	61	61	61	61
62	I	62	62	62	62
63	I	63	63	63	63
64	I	64	64	64	64
65	I	65	65	65	65
66	I	66	66	66	66
67	I	67	67	67	67
68	I	68	68	68	68
69	I	69	69	69	69
70	I	70	70	70	70
71	I	71	71	71	71
72	I	72	72	72	72
73	I	73	73	73	73
74	I	74	74	74	74
75	I	75	75	75	75
76	I	76	76	76	76
77	I	77	77	77	77
78	I	78	78	78	78
79	I	79	79	79	79
80	I	80	80	80	80
81	I	81	81	81	81
82	I	82	82	82	82
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84	I	84	84	84	84
85	I	85	85	85	85
86	I	86	86	86	86
87	I	87	87	87	87
88	I	88	88	88	88
89	I	89	89	89	89
90	I	90	90	90	90
91	I	91	91	91	91
92	I	92	92	92	92
93	I	93	93	93	93
94	I	94	94	94	94
95	I	95	95	95	95
96	I	96	96	96	96
97	I	97	97	97	97
98	I	98	98	98	98
99	I	99	99	99	99
100	I	100	100	100	100

IV.

APPENDIX

GIVING A

DESCRIPTION OF EACH OF THE INVENTIONS SUB-
MITTED TO THE BOARD,

INTENDED

TO ACCOMPANY THE CLASSIFIED NOMENCLATURE OF PARTS AS
SHOWN IN THE DETAILED ILLUSTRATIONS ACCOMPANYING;

PREPARED BY

Lieut. HENRY METCALFE, U. S. Ordnance Corps,

RECORDER OF THE BOARD.

APPENDIX

TABLE I

DESCRIPTION OF FACTS OF THE INVESTIGATION
SUBMITTED TO THE BOARD

TABLE II

TO ACCURATELY STATE THE FACTS OF THE CASE AS
SHOWN IN THE TESTIMONY OF THE WITNESSES

TABLE III

THE TESTIMONY OF THE WITNESSES

TABLE IV

APPENDIX.

The object in view during the writing of the following descriptions has been to present concisely the distinctive features of the different systems of breech-loading small-arms mentioned in the preceding report.

For this purpose no plan seemed more natural than to show the consecutive operations of the parts in the performance of their several functions, during the opening, closing, and locking of the breech, firing the charge, and removing the empty cartridge-shells. These are the objects for the accomplishment of which the systems are variously contrived, and with which alone they are concerned. Questions regarding the caliber, accuracy of fire, and mounting of small-arms, are irrelevant to those involved in these discussions, and belong to departments of research independent of those under consideration by the board. An account of the operation of loading, essentially alike in all breech-loaders, has been omitted; while the working of the parts in opening and closing, and the means employed to fire the charge, to lock the breech against the effect of the explosion, and to extract and eject the empty shell, have been discussed as fully as was consistent with the limits of the work.

In the legends accompanying the illustrations, which have been prepared so as to reduce as closely as possible the various systems of nomenclature to a common standard, the parts have been classed, not only to show those intrinsic to the system under consideration and those not peculiar to it or common to all small-arms, but the former class has been subdivided to exhibit incidentally certain differences of the constructions, affecting their economy of manufacture, facility of maintenance, and liability to accidents requiring repair.

It is generally conceded, for example, that where other parts are to be joined, a pin is often better than a screw, which, besides being expensive to make, requires a special appendage for its service, and when broken, badly marred, or rusted, is most troublesome to remove. Springs, also, as necessary adjuncts, are objectionable, being subject to unexpected breaking and failure; while it is thought by many a continuous stock stands service better than one which is divided into parts. The minor parts are those which, while not specially belonging to any one of the preceding subdivisions, are peculiar to the system, although not indispensable to the proper performance of its duties.

The number and character of the other principal metallic parts afford a pretty sure method of judging of the simplicity of the arm,

though the application of this and other similar rules requires frequent qualification, a wise experience often separating what might be made a single piece into several constituent parts, with a gain in economy, durability, and efficiency. While it also frequently happens that many of the components may be assembled in one separate integral portion of the arm, which is segregated from the rest for the proper and independent performance of its duties.

The descriptions have been arranged according to a classification of breech-loading small-arms founded on the motions of the principal parts employed to secure the advantages which this system of loading affords. When slight differences of construction occur, reference is made to that specimen of the class which is most widely known or most generally accessible. In all cases where doubt or discordance of opinion might arise, the manuscript has been submitted for verification to the exhibitors of the arm; studious care being had meanwhile to avoid reference to the merits or disadvantages of the systems discussed.

ATER.

Colt's; SCOT

E-CARBINE.

EMUTH.

E-GUN; DRE

ERLIN; GRE

GLYN-TOMES;

rill; BARNE

ETSON; BUR

ne forgotten.

SNELL.

BROUGHTON

RDAN-RUSSIA

; WERDER;

NI; WESTLEY

mes.

INGTON-LOCKI

ER; WHITE

HTON, No. 18

WEIGHTS OF THE PRINCIPAL SYSTEMS.

CLASS I, weighing 1 pound 13 ounces :

62. Snell.

CLASS II, weighing 1 pound 15 ounces :

26. Ward-Burton.

38. Dexter.

CLASS III, weighing 2 pounds 2 ounces :

15. Morgenstern.

CLASS IV, weighing 2 pounds 3 ounces :

40. Joslyn-Tomes.

CLASS V, weighing 2 pounds 4 ounces :

57. Russian-Berdan.

51. Milbank.

Mauser. German.

68. Springfield-Allin.

CLASS VI, weighing 2 pounds 5 ounces

Martini-Henry.

69. Springfield.

Werder. Bavarian.

66. Springfield-Stillman.

CLASS VII, weighing 2 pounds 6 ounces :

Chassepot.

99. Springfield.

CLASS VIII, weighing 2 pounds 7 ounces :

53. Lee.

CLASS IX, weighing 2 pounds 8 ounces :

79. Broughton.

63. Peabody.

CLASS X, weighing 2 pounds 9 ounces :

19. Remington.

48. Springfield.

CLASS XI, weighing 2 pounds 10 ounces :

32. Smoot.

41. Spanish-Remington.

CLASS XII, weighing 2 pounds 11 ounces :

- 10. Whitney.
- 22. Remington.
Werndl. Austrian.
- 61. Lee.
Dreyse, improved. German.
- 47. Remington-Schofield.

CLASS XIII, weighing 2 pounds 12 ounces :

- 44. Thomas.
- 21. Remington.
- 20. Remington.
- 18. Broughton.

CLASS XIV, weighing 2 pounds 13 ounces :

- 11. Whitney.
- 43. Remington-Ryder extractor.
Needle-gun. German.
- 54. Lee.

CLASS XV, weighing 2 pounds 14 ounces :

- 67. Remington-Ryder.
- 80. Elliot carbine.
- 97. Ward-Burton magazine.

CLASS XVI, weighing 2 pounds 15 ounces :

- 30. C. M. Spencer.

CLASS XVII, weighing 3 pounds :

- 5. Sharps.
- 45. Broughton.
- 34. Van Choate.

CLASS XVIII, weighing 3 pounds 1 ounce :

- 83. Merrill.

CLASS XIX, weighing 3 pounds 2 ounces :

- 42. Updegraff.

CLASS XX, weighing 3 pounds 3 ounces :

- 59. Freeman.

CLASS XXI, weighing 3 pounds 4 ounces :

- 79. A. T. Freeman.

CLASS XXII, weighing 3 pounds 5 ounces :

- 24. Elliot.
- 3. Scott magazine.

CLASS XXIII, weighing 3 pounds 6 ounces :

- 59. A. T. Freeman.

CLASS XXIV, weighing 3 pounds 15 ounces :

- Vetterlin. Swiss.

CLASS XXV, weighing 4 pounds:
Needle-carbine.

CLASS XXVI, weighing 4 pounds 2 ounces :
78. Winchester repeater.

NOTE.—These weights comprise the working parts of the system. The other parts, such as the stocks, barrels, &c., varied so much as to make a comparison between them of no value. Fractions of ounces were not considered.

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U.S.A.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY
A MOVABLE BARREL WHICH IS SLIDING.

GARDNER'S MAGAZINE.

18 ORD

GARDNER MAGAZINE-ARM, No. 87.

Using the Russian-Berdan brass cartridge, and firing eight shots from a magazine-tube lying beneath the barrel.

Removed before an opportunity was given to photograph it.

Three motions as a magazine-arm, viz: Opened; closed; fired.

Four motions as a single-loader, viz: Opened; loaded; closed; fired.

Opened.—In this arm the barrel and tip-stock slide forward and backward on ways connected with the butt-stock. They are released to move forward, and secured when back, by a hook into which the forward end of the trigger-guard is formed. This guard revolves to a sufficient extent for this purpose, on a pin passing through it, at the forward end of the guard-bow. It locks the piece automatically when it is closed, by the action of a spring at its rearmost end. In moving out the barrel, the hammer is cocked by an internal connection between the barrel and the tumbler. A cartridge having been expelled backward from the magazine by the action of the magazine-spring, it is raised by the striking of a projection on the lower end of the barrel against the forward end of a bent lever, the rearmost end of which lies beneath the cartridge. This passes it up a pair of guides on the face of the frame, so shaped as to hold within their jaws the head of the cartridge by the rim. When it arrives opposite to the mouth of the chamber, it is passed into it by closing the piece.

Closed.—By drawing back the barrel and tip-stock into their original positions with the left hand.

Locked.—The cartridge is introduced into the chamber and the moving parts locked, as above described.

Fired.—The piece can then be fired by a center-lock of the usual pattern, the trigger being blocked by the trigger-guard until the barrel is completely closed.

Extraction.—By repeating the movements, as described, the succeeding cartridge will pass up the guides as before, and, striking from below the empty one just fired, will throw it up the guides with sufficient force to send it clear of the gun. The magazine is charged through the trough into which the space between the ways is formed. The issue of the cartridges from the magazine is limited to one at each forward motion of the barrel, by the interposition of a spring-stop, which is pressed out of the way by the barrel at the end of its stroke.

Cut off.—The magazine can be cut off and held in reserve by a revolving eccentric stop, moved by a thumb-piece on the outside.

Single-loader.—The arm can then be used as a single-loader, by inserting the rim of the cartridges into the guides at each opening of the piece.

By a cam-motion of the movable trigger-guard power is obtained to start the barrel slightly away from the butt, and thus to overcome the chief obstacle to the removal of the empty shell, viz: its sticking at the start.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BARREL, WHICH ROTATES ABOUT AN AXIS PARALLEL TO THE AXIS OF THE BARREL.

SCOTT'S.

HELM.

SCOTT MAGAZINE-CARBINE No. 2.

Four motions as a magazine-arm, viz: Cocked, opened, closed, and fired.

As a single-loader, five motions, viz: Cocked, opened, loaded, closed, and fired.

Opened.—By cocking the hammer, releasing the barrel-catch, and allowing the barrel to revolve on an axis parallel to and beneath it, until the chamber comes opposite to the magazine. It swings aside the magazine-lid as it passes over the mouth of the magazine, and is automatically loaded by the action of the magazine-spring.

Closed.—By reversing the action of the barrel, the barrel-catch springs into place and holds it shut.

Locked.—By the noses of the barrel-catch and hammer engaging with corresponding notches in the end of the barrel.

Fired.—By a center-lock of the usual pattern.

Extraction.—By a sliding extractor moving in a spiral-cam recess on the axis during the revolution of the barrel.

Ejection.—None. The shell dropping out as the gun is opened.

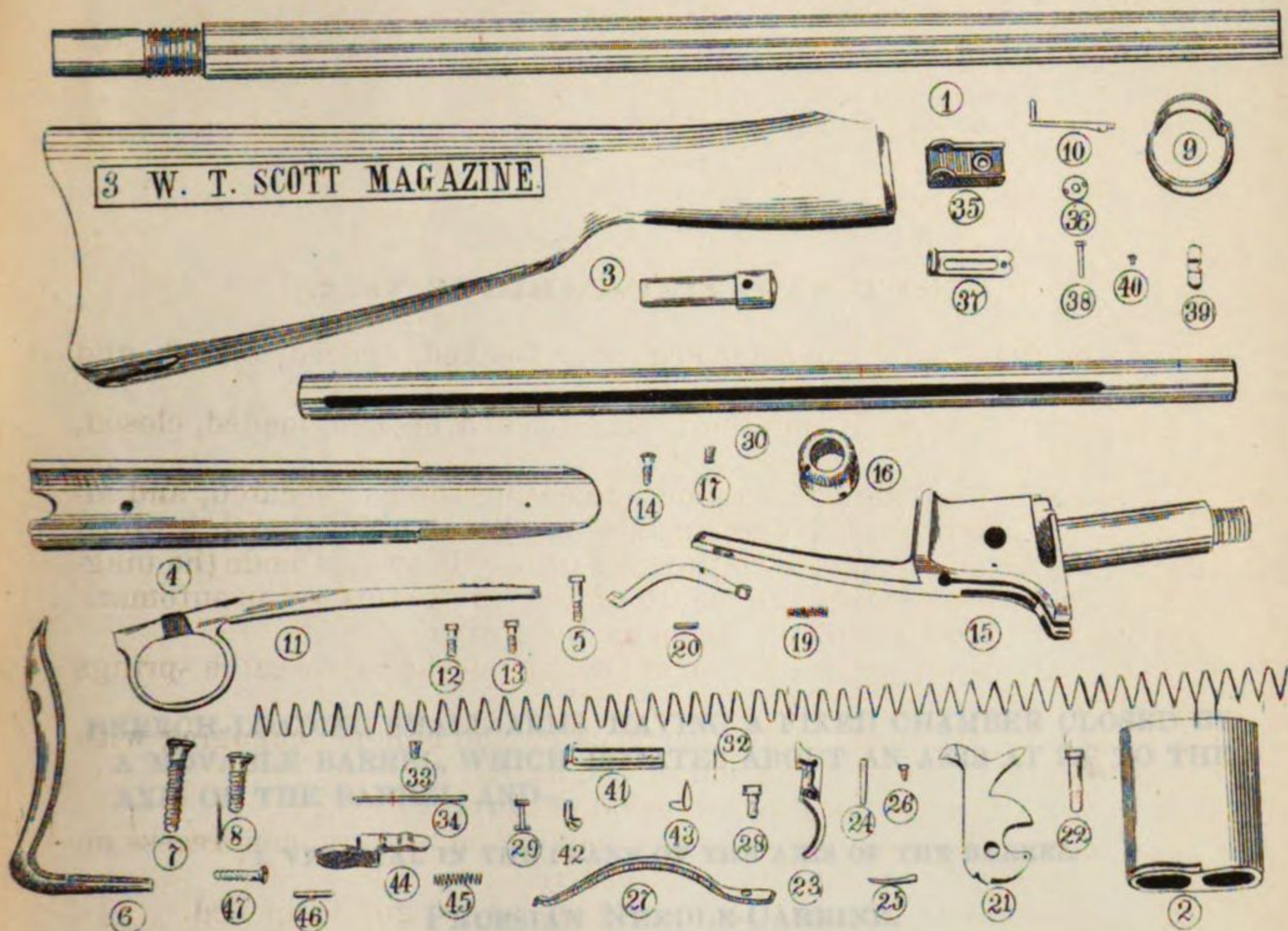
The magazine lies in the butt-stock, is charged from in front, and is closed by a sliding lid, which is kept in place by the action of a suitable spring.

HELM, No. 56.

Withdrawn before being photographed.

A revolving carbine, the peculiar feature of which is the connection of the tumbler with a movable butt-plate, so arranged that by pressing the piece against the shoulder, in aiming, the hammer may be simultaneously cocked.

The cylinder also can be conveniently removed from the side, and replaced by a loaded one, if desired.



35 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 3 Butt Stock,
- 4 Tip Stock.

FOURTEEN principal metallic parts not otherwise mentioned :

- 2 Receiver,
- 15 Breech Frame,
- 16 Breech Frame Nut,
- 21 Hammer,
- 18 Barrel Catch,
- 11 Guard,
- 23 Trigger,
- 30 Magazine,
- 31 Magazine Plunger,

- 44 Magazine Lid,
- 41 Extractor,
- 42 Extractor Lever,
- 43 Extractor Lever,
- 29 Main Spring Swivel.

THIRTEEN Screws :

- 5 Tip Stock Screw,
- 17 Breech Block Nut Screw,
- 22 Hammer Screw,
- 20 Barrel Catch Spr. Screw,
- 12 Guard Screw,
- 13 Guard Screw,
- 47 Guard Screw,
- 14 Tang Screw,

- 24 Trigger Screw,
- 26 Trigger Spring Screw,
- 28 Main Spring Screw,
- 33 Magazine Plunger Screw,
- 46 Magazine Stop Screw.

ONE Pin :

- 34 Magazine Plunger Spring Pin.

FIVE Springs :

- 19 Barrel Catch Spring,
- 25 Trigger Spring,
- 27 Main Spring,
- 32 Magazine Spring,
- 45 Magazine Stop Spring.

13 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

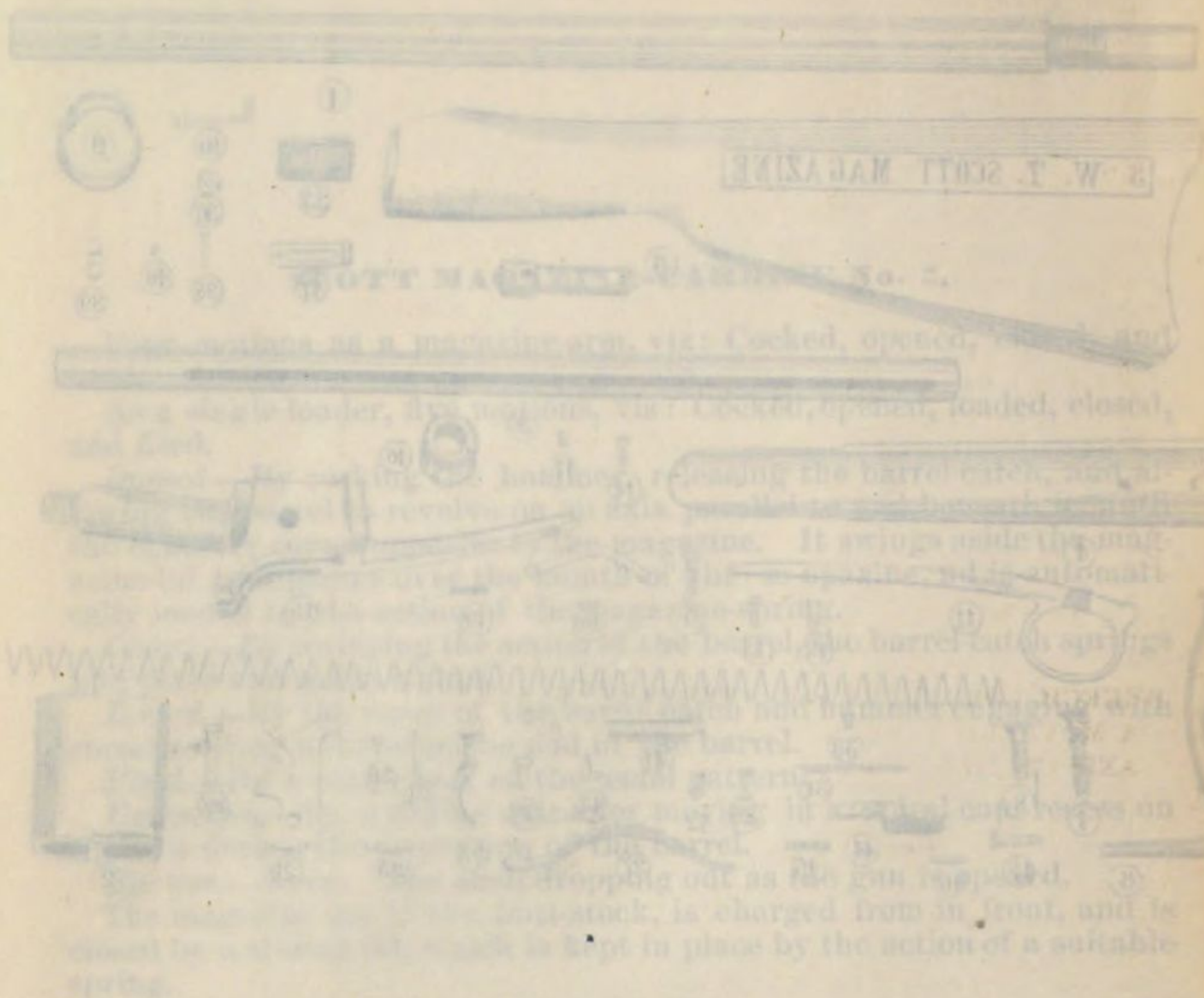
- 1 Barrel and Front Sight,
- 6 Butt Plate,
- 7 Butt Plate Screw,
- 8 Butt Plate Screw,

- 9 Band,
- 10 Band Spring,
- 35 Rear Sight Base,
- 36 Rear Sight Base Screw,

- 37 Rear Sight Leaf,
- 38 Rear Sight Joint Screw,
- 39 Rear Sight Leaf Slide,
- 40 Rear Sight Leaf Screw.

W. T. SCOTT (MAGAZINE), No. 3.

7



PARTS LISTED AND REFERRED TO IN THE	
1. Front and Rear Sight	2. Front Sight
3. Front Sight Screw	4. Front Sight
5. Front Sight	6. Front Sight
7. Front Sight	8. Front Sight
9. Front Sight	10. Front Sight
11. Front Sight	12. Front Sight
13. Front Sight	14. Front Sight
15. Front Sight	16. Front Sight
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41. Front Sight	42. Front Sight
43. Front Sight	44. Front Sight
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63. Front Sight	64. Front Sight
65. Front Sight	66. Front Sight
67. Front Sight	68. Front Sight
69. Front Sight	70. Front Sight
71. Front Sight	72. Front Sight
73. Front Sight	74. Front Sight
75. Front Sight	76. Front Sight
77. Front Sight	78. Front Sight
79. Front Sight	80. Front Sight
81. Front Sight	82. Front Sight
83. Front Sight	84. Front Sight
85. Front Sight	86. Front Sight
87. Front Sight	88. Front Sight
89. Front Sight	90. Front Sight
91. Front Sight	92. Front Sight
93. Front Sight	94. Front Sight
95. Front Sight	96. Front Sight
97. Front Sight	98. Front Sight
99. Front Sight	100. Front Sight

W. T. SCOTT MAGAZINE, No. 1

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BARREL, WHICH ROTATES ABOUT AN AXIS AT 90° TO THE AXIS OF THE BARREL, AND—

1. VERTICAL IN THE PLANE OF THE AXIS OF THE BARREL.

PRUSSIAN NEEDLE-CARBINE.

PRUSSIAN NEEDLE-CARBINE.

Four motions, viz: Opened; loaded; closed; fired.

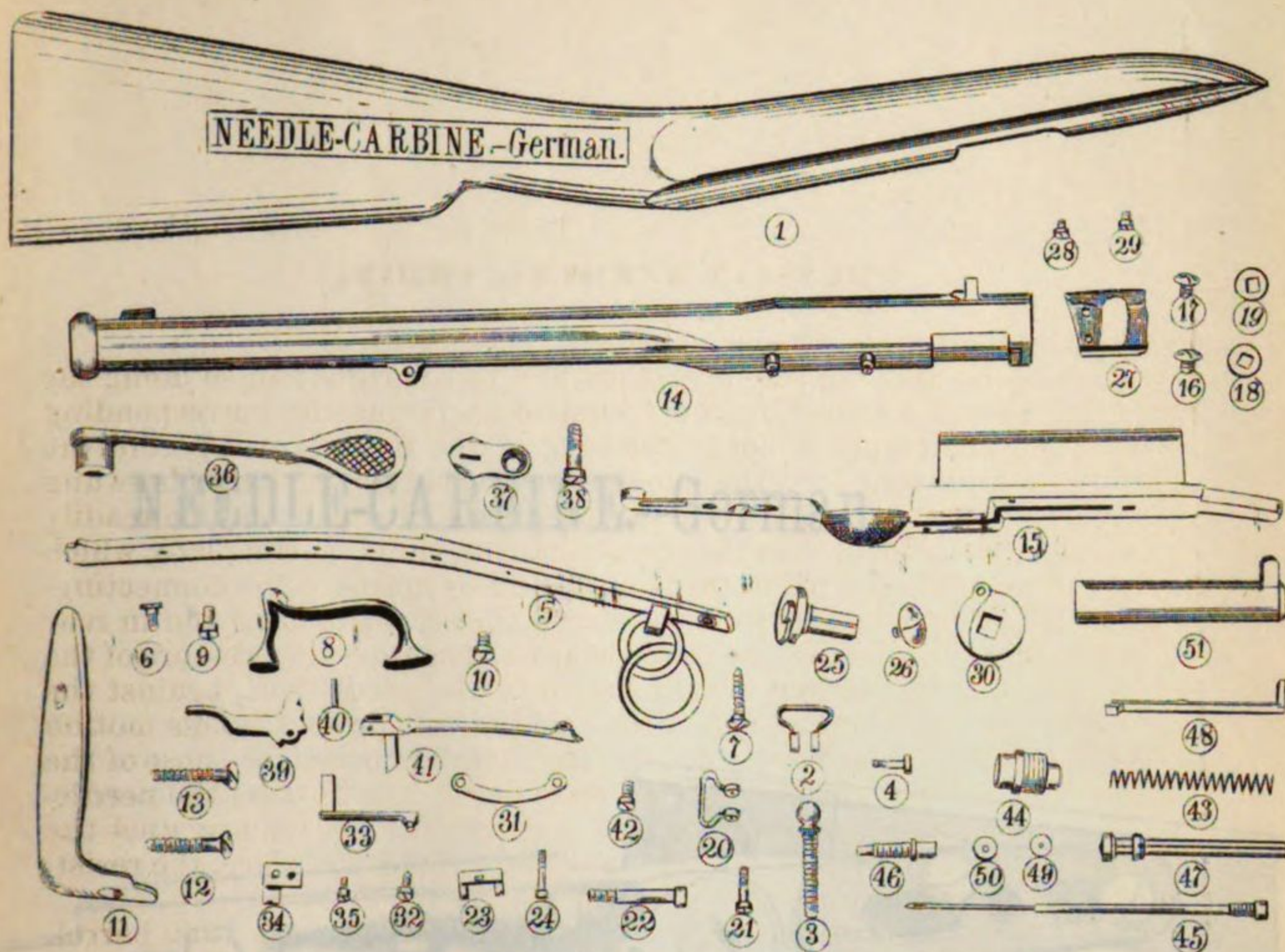
Opened.—By turning the lever back and to the right; in so doing the barrel is moved forward by the eccentric as far as the corresponding arm of the heart-shaped slot in the tang of the receiver will permit the rear guide-stud to go. By the same means the butt of the barrel is swung around to the right, so that the mouth of the chamber may be readily reached with the load. As the eccentric turns, the eccentric plate, which is on the same shaft with it, turns also; and by means of the connecting-rod, which is linked at its forward end to the eccentric plate and in rear to the cocking-bolt, slides the latter backward against the pressure of the spiral mainspring surrounding the stem of the needle-bolt, against the face of which the vertical arm of the cocking-bolt presses. This motion is so timed, that at the moment the piece is fully opened, the nose of the spring-sear riding over the beveled shoulder of the fillet on the needle-bolt, catches against its square face, and retains the bolt against the pressure of the mainspring, when, in order to load the piece, the resistance of the hand has been withdrawn.

Closed.—By returning the lever to its place beneath the barrel, the barrel is first swung round in the prolongation of its original position, and is then drawn back so that the gas-plug projecting from the receiver shall enter the mouth of the chamber.

Fired.—By the means described in the Prussian needle-gun, (q. v.) In case of a failure to ignite the charge, the piece, without opening it, may be recocked by the means therein described.

The arm using a self-consuming cartridge-case, no extracting or ejecting apparatus is needed.

The enormous swell left at the muzzle of this piece, it is supposed, is intended to protect it from the indentations likely to occur in use in the mounted service.



41 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

1 Stock.

EIGHTEEN principal metallic parts not otherwise mentioned :

5 Guard Strap,
8 Guard,
15 Receiver,
25 Eccentric,
27 Eccentric Guide Plate,
30 Eccentric Plate,
31 Connecting Rod,
33 Cocking Bolt,
34 Cocking Bolt Cover,
36 Lever,
37 Lever Stop,
39 Trigger,

44 Gas Plug,
45 Needle,
45 Needle Spindle,
46 Needle Guide,
47 Needle Bolt,
51 Lock Tube.

FOURTEEN Screws :

6 Guard Strap Screw,
7 Guard Strap Screw,
9 Guard Screw,
10 Guard Screw,
16 Guide Stud Screw,
17 Guide Stud Screw,
22 Tang Screw,
26 Eccentric Screw,
28 Eccentric Guide Plate Scr.

29 Eccentric Guide Plate Scr.
32 Cocking Bolt Screw,
35 Cocking Bolt Cover Scr.,
38 Lever Stop Screw,
42 Spring Sear Screw.

ONE Pin :

40 Trigger Pin.

THREE Springs :

48 Spring Catch,
43 Main Spring,
41 Spring Sear.

FOUR other minor parts :

18 Guide Stud Scr'w Washer,
19 Guide Stud Scr'w Washer,
49 Needle Bolt Washer,
50 Needle Bolt Washer.

16 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Stock Swivel,
3 Stock Swivel Screw,
4 Stock Swivel Hinge Scr.,
11 Butt Plate,
12 Butt Plate Screw,

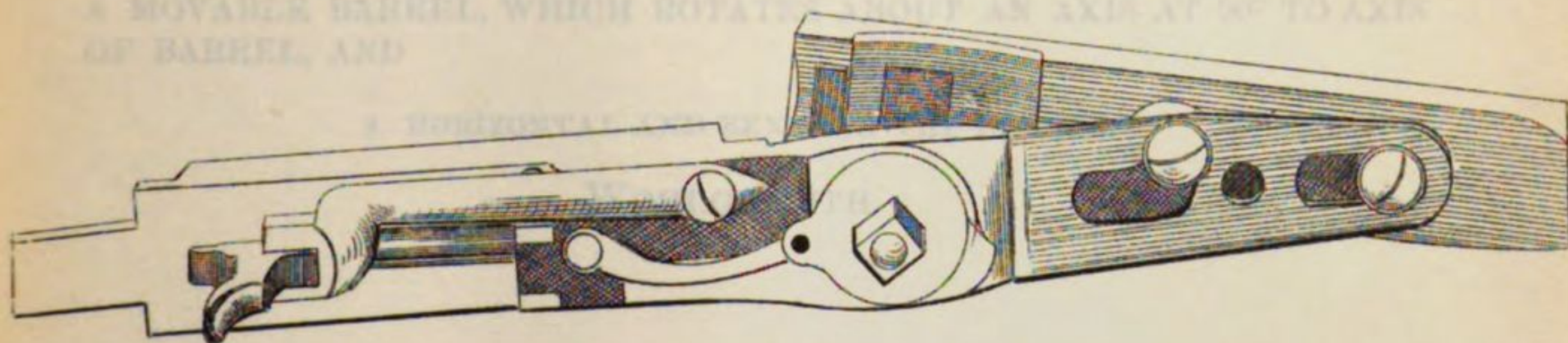
13 Butt Plate Screw,
14 Barrel, Front Sight, Rear
Sight Base and Swivel
Stud,
23 Rear Sight Leaf.

24 Rear Sight Leaf Screw,
5 Swivel Ring,
5 Swivel Ring,
20 Band Swivel,
21 Band Swivel Screw.

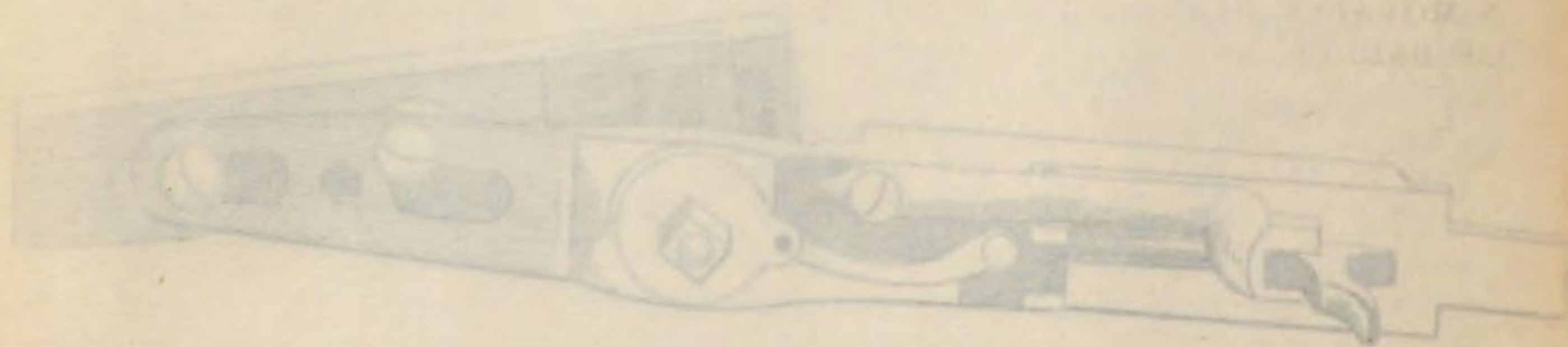
NEEDLE CARBINE. (GERMAN).

NEEDLE-CARBINE.--German.

RECEED-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY
A MOVABLE BARREL, WHICH ROTATES ABOUT AN AXIS AT 90° TO AXIS
OF BARREL, AND



NEEDLE-CARBINE--GOLTMAN.



BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY
A MOVABLE BARREL, WHICH ROTATES ABOUT AN AXIS AT 90° TO AXIS
OF BARREL, AND

2. HORIZONTAL AND BENEATH THE BARREL.

WOHLGEMÜTH.

WOHLGEMÜTH, Nos. 16 and 17.

Withdrawn before being photographed.

These arms, on the general plan of the Lefauchaux system of fowling-pieces, are essentially alike, and use pin-fire cartridges. One of the barrels is provided with a rifled lining which, being removed, shows a smooth-bore barrel of larger caliber for the use of cartridges containing buck-shot.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK WHICH SLIDES IN THE LINE OF THE BARREL BY DIRECT ACTION, *I. E.*, *BOLT-GUNS* WHICH HAVE—

1. CONCEALED LOCKS.

PRUSSIAN NEEDLE-GUN.

DREYSE'S IMPROVED NEEDLE-GUN.

CHASSEPOT.

WARD-BURTON.

MAUSER.

VETTERLIN.

GREENE, No. 14.

MILBANK, No. 51.

LEE, No. 53.

PRUSSIAN NEEDLE-GUN.

Six motions, viz: Released; opened; loaded; closed; cocked; fired.

Opened.—By releasing the spring-catch by pressing down upon it, and then drawing it back by the thumb. This slides the projecting thumb-piece of the lock-tube out of its square notch in the receiver, and allows the handle of the breech-bolt to be raised to a vertical position and the bolt itself to be withdrawn.

Closed.—The piece may then be closed by reversing the movement of the bolt, and—

Locked.—By turning down the base of the handle against the recoil-shoulder formed for it on the receiver.

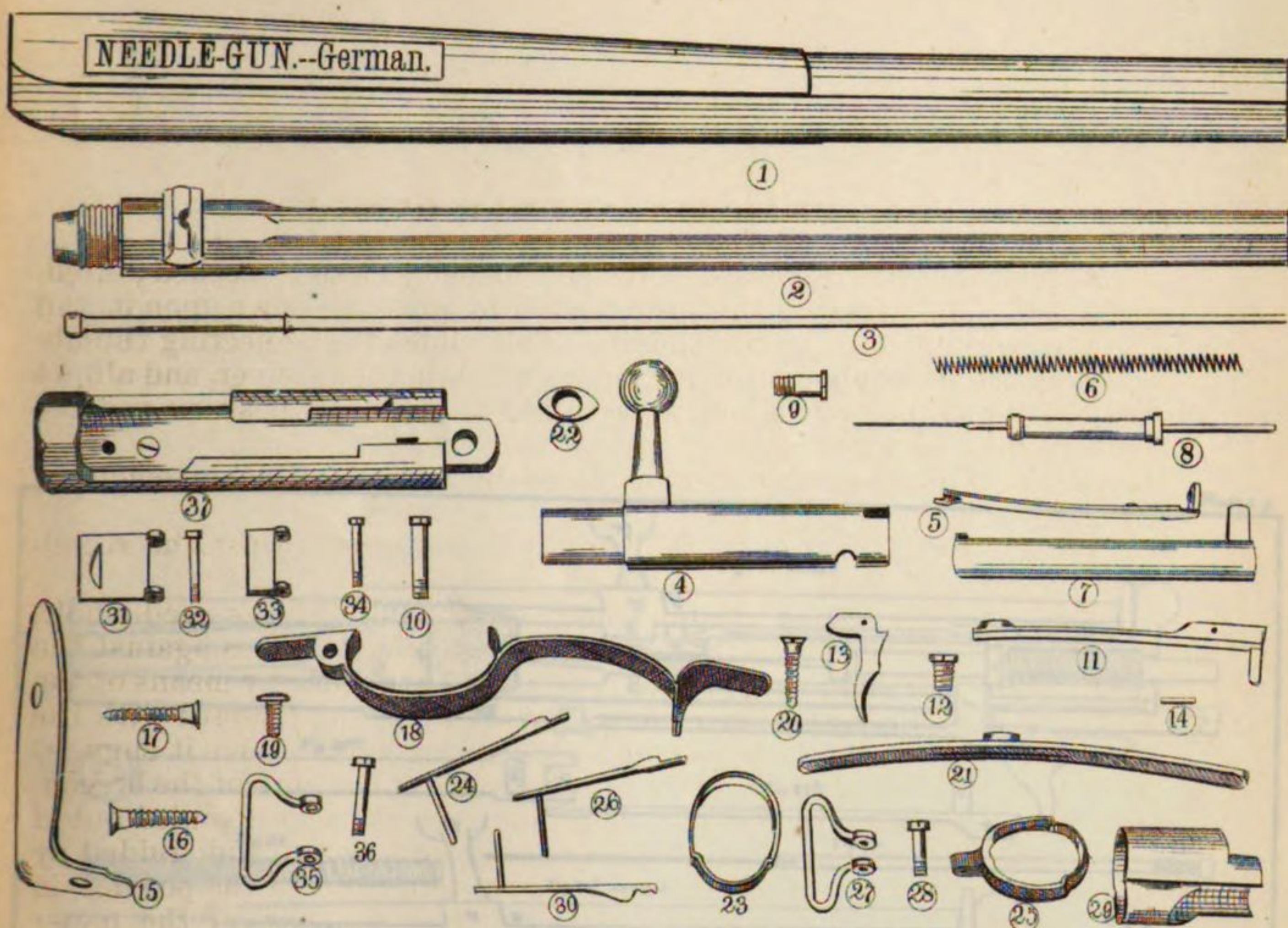
Fired.—In the act of closing, the front shoulder of the needle-bolt, around the stem of which the mainspring is coiled, catches against the nose of the sear and pushes the lock-tube out to the rear by means of the mainspring included between them. By then pushing forward with the hand the base of the lock-tube until the spring-catch above it engages with a corresponding notch in the upper surface of the bore of the breech-bolt, the mainspring is compressed, so that when the sear is pulled out of the way by the trigger, the needle may be darted forward, and, guided by a small hole in the face of the bolt, find its way through the powder in the cartridge to explode the fulminate lying in the base of the paper sabot which surrounds the ball.

The cartridge being self-consuming, no extracting or ejecting devices are required.

The butt of the barrel is chamfered, and the face of the breech-bolt is counter-bored at the same angle, so as to make a close fit and to prevent as far as possible the escape of gas.

The recoil-shoulder on the receiver is inclined to the front, so that as the ends of the barrel and breech-bolt wear off, the bolt may be brought forward to supply their loss. The arm may be cocked independently of the bolt, by first withdrawing, and then shoving forward the lock-tube.

The system may be dismounted by withdrawing the bolt, and at the same time pulling hard on the trigger; this causes a change of fulcrum to the rearmost of the scalloped surfaces, into which its upper side is formed, and permits the nose of the sear to be pulled completely out of the way for the passage of the bolt.



19 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

1 Stock.

EIGHT principal metallic parts not otherwise mentioned :

4 Breech Bolt,
8 Needle,
8 Needle Bolt,
7 Lock Tube,
13 Trigger,

18 Guard,
21 Trigger Plate,
37 Receiver.

FIVE Screws :

9 Recoil Screw,
10 Tang Screw,
12 Spring Sear Screw,
19 Guard Screw, Upper
20 Guard Screw, Lower

ONE Pin :

14 Trigger Pin.

THREE Springs :

6 Main Spring,
5 Spring Catch,
11 Spring Sear.

ONE other minor part :

22 Recoil Screw Escutcheon.

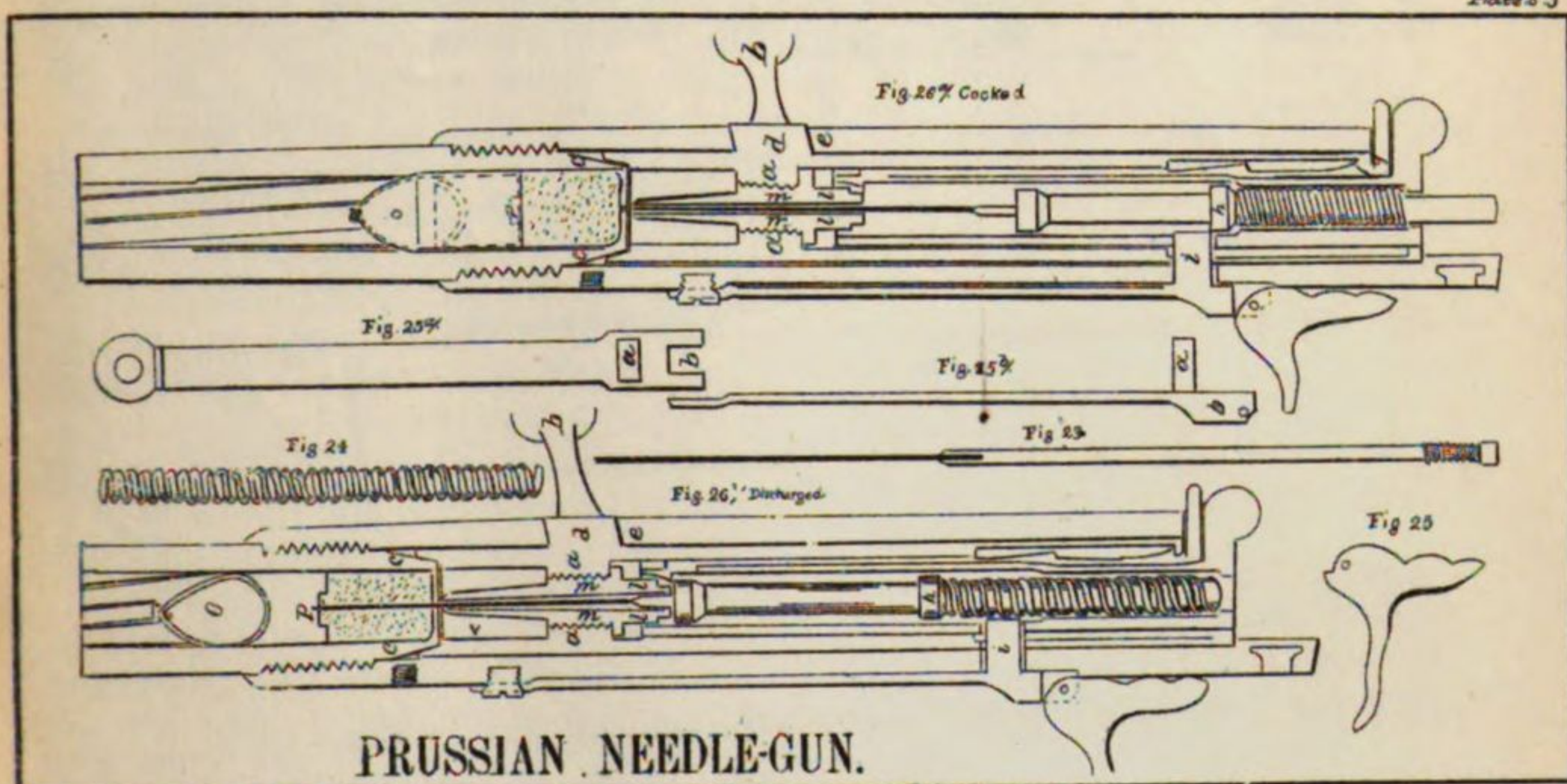
21 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Barrel, Front Sight and
Rear Sight Base,
3 Ramrod,
15 Butt Plate,
16 Butt Plate Screw,
17 Butt Plate Screw,
23 Lower Band,

24 Lower Band Spring,
25 Middle Band,
26 Middle Band Spring,
27 Middle Band Swivel,
28 Middle Band Screw,
29 Upper Band,
30 Upper Band Spring,

31 Rear Sight Leaf, Long
32 Rear Sight Leaf, Long Scr.
33 Rear Sight Leaf, Short
34 Rear Sight Leaf, Short
Screw,
35 Guard Swivel,
36 Guard Swivel Screw.

NEEDLE GUN, (GERMAN).



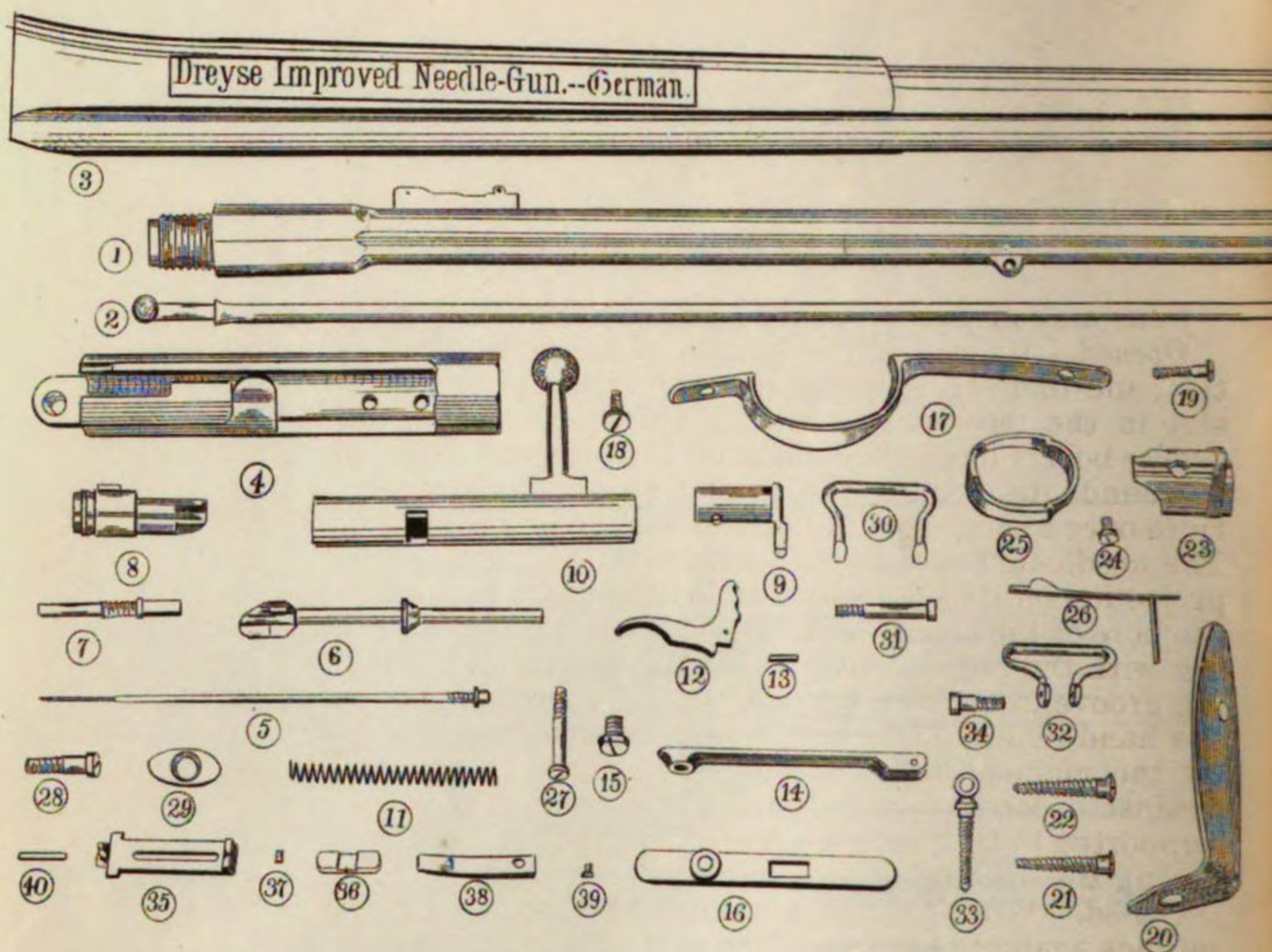
IMPROVED NEEDLE BOX

IMPROVED NEEDLE BOX

The object of the present invention is to provide a simple and effective means for holding a needle in a box, and for preventing the needle from falling out of the box when the box is closed. The invention consists of a box having a lid, and a needle holder mounted on the lid. The needle holder is adapted to receive a needle, and to hold it in place when the lid is closed. The needle holder is made of a material which is strong and durable, and which is adapted to be used in a variety of ways. The needle holder is made of a material which is strong and durable, and which is adapted to be used in a variety of ways. The needle holder is made of a material which is strong and durable, and which is adapted to be used in a variety of ways.

By the use of the present invention, a needle can be held in a box, and the needle can be prevented from falling out of the box when the box is closed. The invention is a simple and effective means for holding a needle in a box, and for preventing the needle from falling out of the box when the box is closed. The invention consists of a box having a lid, and a needle holder mounted on the lid. The needle holder is adapted to receive a needle, and to hold it in place when the lid is closed. The needle holder is made of a material which is strong and durable, and which is adapted to be used in a variety of ways. The needle holder is made of a material which is strong and durable, and which is adapted to be used in a variety of ways. The needle holder is made of a material which is strong and durable, and which is adapted to be used in a variety of ways.

IMPROVED NEEDLE BOX



20 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

3 Stock.

TEN principal metallic parts
not otherwise mentioned :

4 Receiver,
5 Needle,
6 Needle Bolt,
7 Needle Guide,
8 Recoil Block,

9 Thumb Piece,
10 Breech Bolt,
12 Trigger,
16 Trigger Plate,
17 Guard.

FIVE Screws :

15 Spring Sear Screw,
18 Guard Screw,
19 Guard Screw,
27 Tang Screw,

28 Recoil Screw.

ONE Pin :

13 Trigger Pin.

TWO Springs :

14 Spring Sear,
11 Main Spring.

ONE other minor part :

29 Recoil Screw Escutcheon.

26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

1 Barrel, Front Sight, Rear
Sight Base, Tip Stud, Re-
coil Stud, Bayonet Stud,
Ramrod Stop,
2 Ramrod,
20 Butt Plate,
21 Butt Plate Screw,
22 Butt Plate Screw,

23 Tip,
24 Tip Screw,
25 Band,
26 Band Spring,
30 Upper Swivel,
31 Upper Swivel Screw,
32 Lower Swivel,
33 Lower Swivel Screw,

34 Lower Swivel Joint Ser.,
35 Rear Sight Leaf,
36 Rear Sight Leaf Slide,
37 Rear Sight Leaf Screw,
38 Rear Sight Spring,
39 Rear Sight Spring Screw,
40 Rear Sight Joint Pin.

DREYSE IMPROVED NEEDLE GUN, (GERMAN).

DREYSE IMPROVED NEEDLE-GUN.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By raising the handle of the breech-bolt to a vertical position, and then withdrawing it to the extent permitted by the form of the slot in the receiver in which it slides. In turning up the handle, the needle-bolt is forced back against the pressure of the mainspring which surrounds its stem, by means of a spiral shoulder near its head, which rides over a corresponding helical surface on the stem of the recoil-block. The needle-bolt is compelled to turn with the breech-bolt by means of a projection on its head which slides to and fro in a longitudinal groove in the bore of the breech-bolt; and the recoil block is prevented from turning with the breech-bolt by a similar projection sliding in a corresponding groove in the receiver. When fully forced back and the pressure of the hand removed, the needle-bolt is kept from being thrown forward by the mainspring by means of a square portion of its face coming against a corresponding part of the back surface of the recoil-block. Supported in this way, the needle-bolt moves back with the other parts during the opening of the piece.

Closed.—When the breech is closed by the usual means the needle-bolt catches against the nose of the sear, and is retained by it.

Fired.—By the act of turning down the handle into place, the square end of the needle-bolt is rotated off its bearing on the stem of the recoil-block, leaving the needle-bolt and the needle free to be driven forward by the mainspring, when the sear is pulled out of its way by the trigger, as in the Prussian needle gun, p. 252.

Locked.—It is locked in the same manner therein described.

The other remarks also apply.

The arm may be cocked without opening it, if so desired, by drawing back the needle-bolt by means of the thumb-piece, until the nose of the sear catches against the fillet on the needle-bolt as before described. By then pressing forward the thumb-piece till a stud on its upper surface engages in the transverse arm of an L-shaped slot in the breech-bolt, the mainspring is compressed, and may be released as above described.

The thumb-piece and needle-bolt are connected together by the needle, which passes through a small hole in the base of the thumb-piece, and is screwed into the rear end of the needle-bolt.

CHASSEPOT.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—In drawing back the cocking-piece out of the slot in the receiver to its full extent, with the hand, it compresses the spiral mainspring surrounding the needle-bolt, which is screwed into the face of the cocking-piece. When the pressure of the hand is removed, the cocking-piece is kept from flying forward, by engaging with the nose of the spring-sear, over which it has ridden in the act of withdrawal. A stud in the lower surface of its projecting lip, having then disengaged itself from a corresponding notch in the upper surface of the breech-bolt, the latter may be revolved by its handle and withdrawn. It is stopped by the front end of a groove on its right side, striking against a stop-screw in the side of the receiver.

When disengaged from the sear, by the withdrawal of the bolt in opening the piece, the cocking-piece is still kept cocked by the revolution of the bolt having brought the notch before spoken of away from in front of the stud on the cocking-piece, so that it now rests directly on the rear face of the breech-bolt. When the piece is closed, the stud again returns opposite to the notch, but, as before, is kept from entering it by engaging with the spring sear.

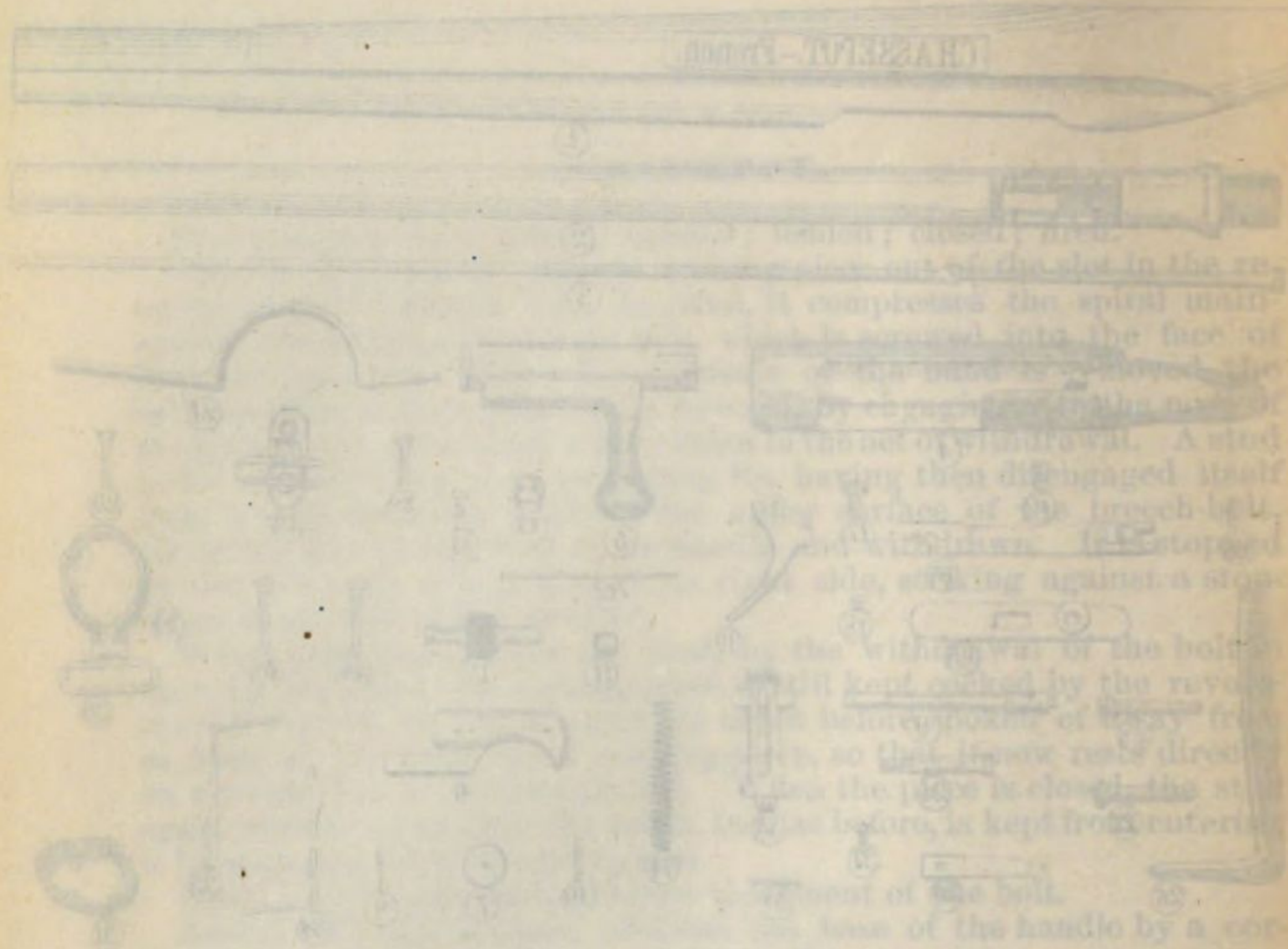
Closed.—By reversing the former movement of the bolt.

Locked.—By the support afforded the base of the handle by a corresponding mortise in the side of the receiver.

Fired.—By disengaging, through the pressure of the trigger, the nose of the sear from its hold against the face of the cocking-piece. This allows the mainspring to impel it forward to the depth of its notch in the breech-bolt and to drive the needle, which it holds, against the percussion-cap in the bottom of the cartridge. At the moment of the discharge, the middle portion of the washer surrounding the rear stem of the needle-guide, being made of soft rubber, while the extremities are of harder material, is laterally expressed against the walls of the chamber by the longitudinal motion permitted to the guide, and by so closing the mouth of chamber, prevents the escape of gas.

A friction-roll in the cocking-piece allows it to move freely notwithstanding the downward pressure of the thumb in opening. The arm using a self-consuming cartridge, the usual devices for extraction and ejection are dispensed with. Close to the firing-notch in the breech-bolt is a shallower notch, into which, by turning the bolt to a proper point, the cocking-piece may be let down into a position of safety.

CHASSIS - FRONT



1. Lower front spring
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96. Lower front spring
97. Lower front spring
98. Lower front spring
99. Lower front spring
100. Lower front spring

CHASSIS - FRONT

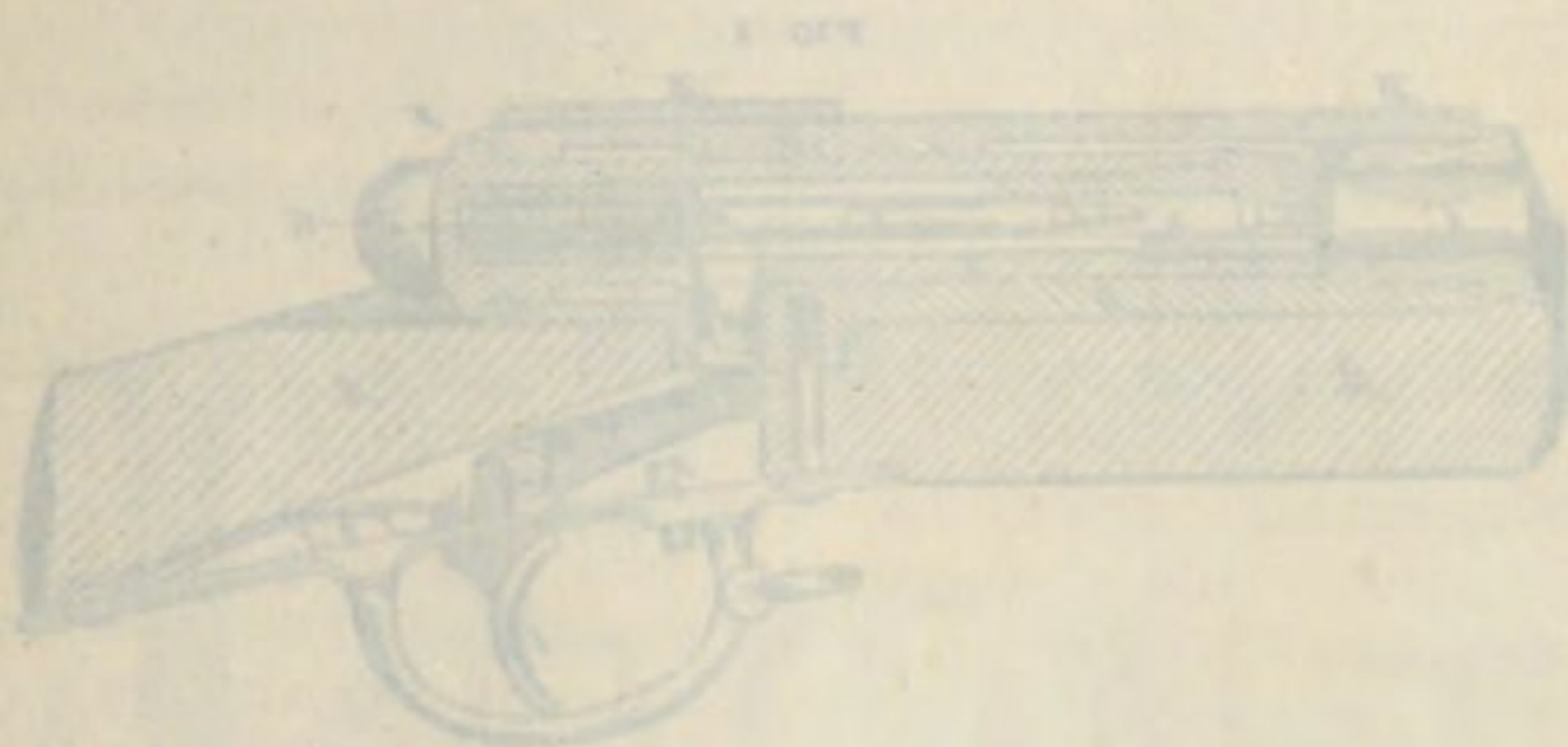


FIG. 1. A semi-automatic handgun, showing the internal mechanism.

- | | | |
|-----------------|-------------------|-----------------------|
| A. Stock | F. Trigger | K. Trigger Stop Screw |
| B. Receiver | G. Main Spring | L. Hammer |
| C. Chamber | H. Recoil Spring | M. Extractor |
| D. Recoil Block | I. Trigger | N. Pinning Pin |
| E. Recoil Pin | J. Trigger Spring | O. Empty Shell |

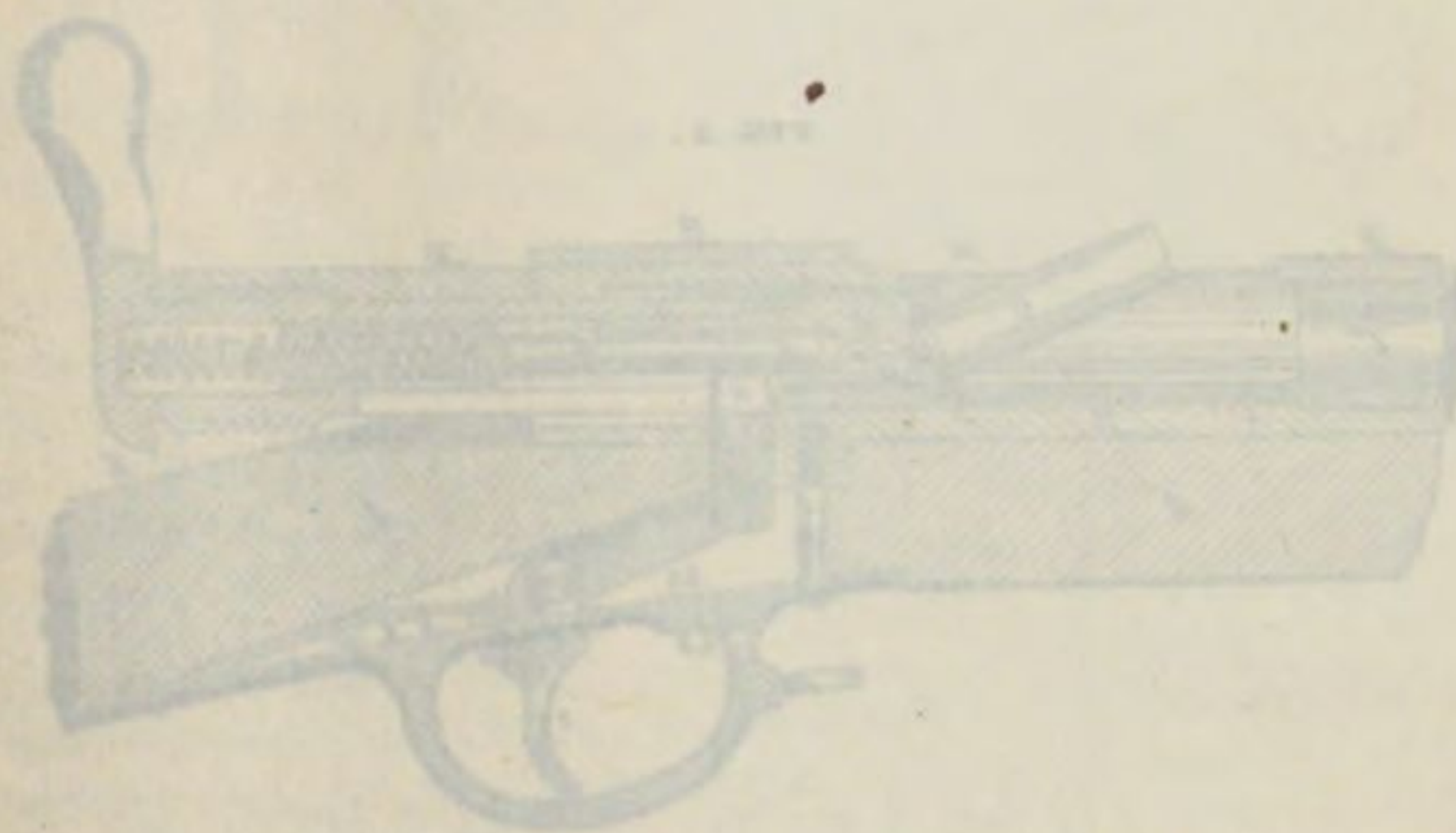
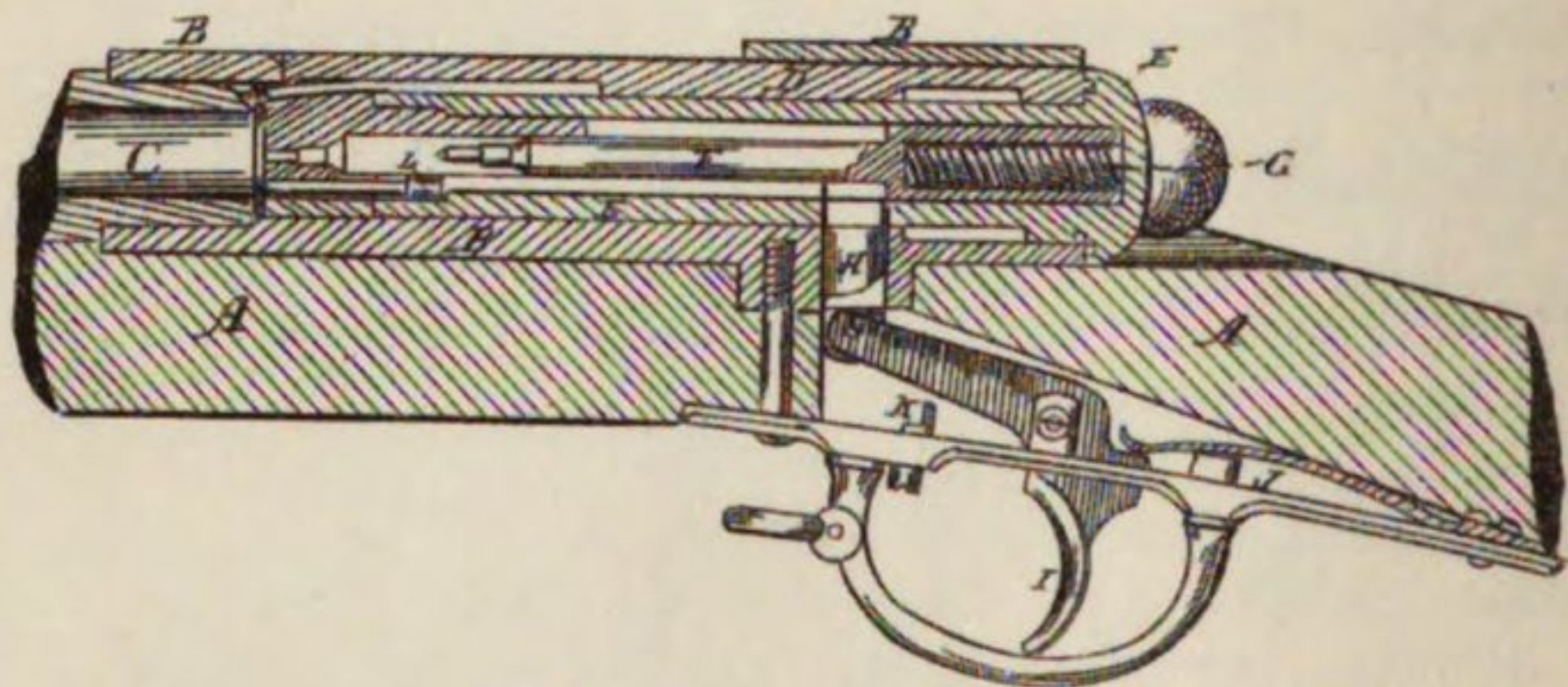


FIG. 2. A semi-automatic handgun, showing the internal mechanism.

WARD-HORTON MURKIN FIG. 1-2

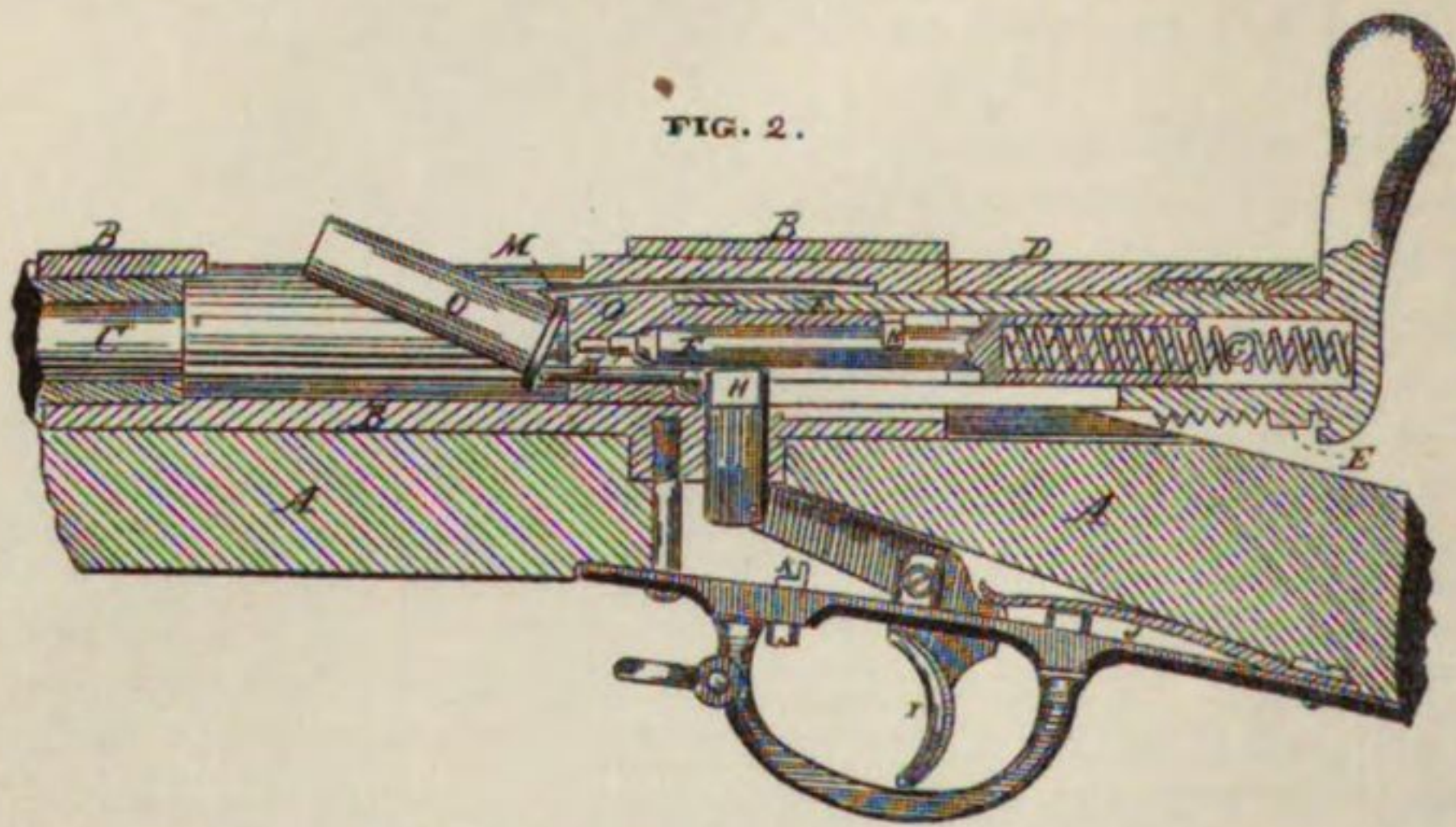
FIG. 1.



BREECH SYSTEM Sectional View when ready for Firing.

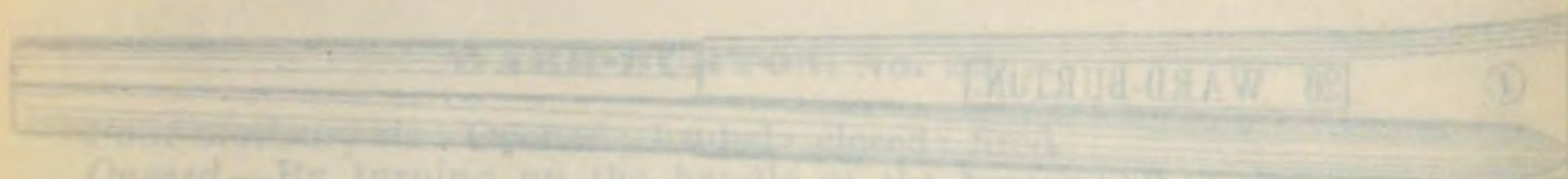
- | | | |
|------------------|--------------------|------------------------|
| A. Stock, | F. Firing Pin, | K. Trigger Stop Screw, |
| B. Receiver, | G. Main Spring, | L. Ejector, |
| C. Chamber, | H. Sear Bolt, | M. Extractor, |
| D. Recoil Block, | I. Trigger, | N. Firing Pin Cam, |
| E. Breech Bolt, | J. Trigger Spring, | O. Empty Shell. |

FIG. 2.



BREECH SYSTEM Sectional View when Open, ejecting Shell

WARD-BURTON MUSKET. FIGS. 1. 2



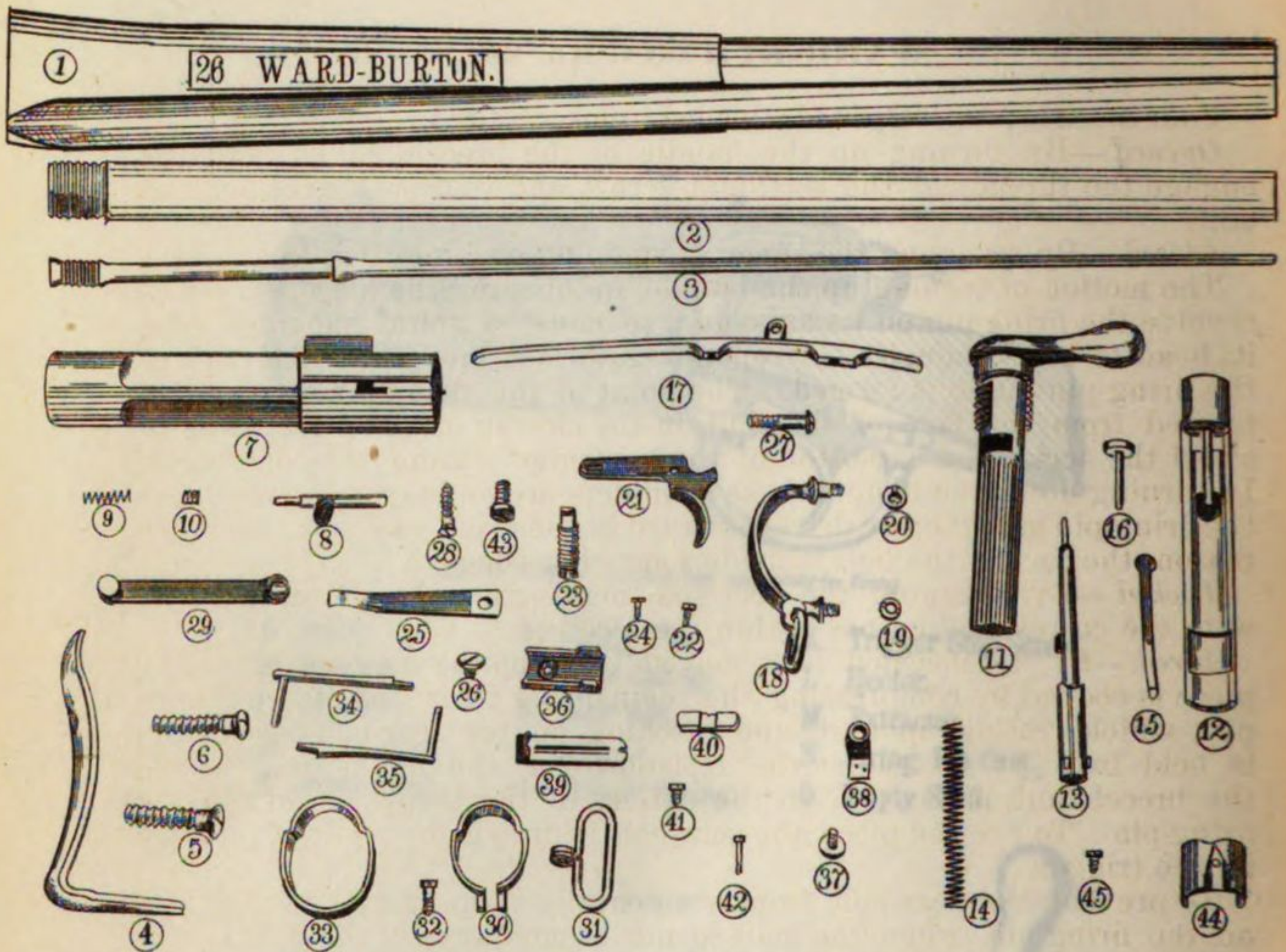
On card.—By turning up the handle of the breech, the gun is raised and the trigger is pulled down, and the gun is fired.

On card.—By turning up the handle of the breech, the gun is raised and the trigger is pulled down, and the gun is fired.

The motion of turning up the handle of the breech, in opening the gun, is a simple one, and is accomplished by a lever, which is pivoted at the breech, and has a handle at the front. The handle is turned up, and the gun is raised. The trigger is pulled down, and the gun is fired. The gun is then lowered, and the trigger is released. The gun is then ready to be fired again.

Extraction.—By a spring hook, the gun is raised, and the trigger is pulled down, and the gun is fired.

WARD-BURTON, No. 22	
1. Upper hand barrel	2. Upper hand barrel
3. Upper hand barrel	4. Upper hand barrel
5. Upper hand barrel	6. Upper hand barrel
7. Upper hand barrel	8. Upper hand barrel
9. Upper hand barrel	10. Upper hand barrel
11. Upper hand barrel	12. Upper hand barrel
13. Upper hand barrel	14. Upper hand barrel
15. Upper hand barrel	16. Upper hand barrel
17. Upper hand barrel	18. Upper hand barrel
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21. Upper hand barrel	22. Upper hand barrel
23. Upper hand barrel	24. Upper hand barrel
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35. Upper hand barrel	36. Upper hand barrel
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41. Upper hand barrel	42. Upper hand barrel
43. Upper hand barrel	44. Upper hand barrel
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47. Upper hand barrel	48. Upper hand barrel
49. Upper hand barrel	50. Upper hand barrel
51. Upper hand barrel	52. Upper hand barrel
53. Upper hand barrel	54. Upper hand barrel
55. Upper hand barrel	56. Upper hand barrel
57. Upper hand barrel	58. Upper hand barrel
59. Upper hand barrel	60. Upper hand barrel
61. Upper hand barrel	62. Upper hand barrel
63. Upper hand barrel	64. Upper hand barrel
65. Upper hand barrel	66. Upper hand barrel
67. Upper hand barrel	68. Upper hand barrel
69. Upper hand barrel	70. Upper hand barrel
71. Upper hand barrel	72. Upper hand barrel
73. Upper hand barrel	74. Upper hand barrel
75. Upper hand barrel	76. Upper hand barrel
77. Upper hand barrel	78. Upper hand barrel
79. Upper hand barrel	80. Upper hand barrel
81. Upper hand barrel	82. Upper hand barrel
83. Upper hand barrel	84. Upper hand barrel
85. Upper hand barrel	86. Upper hand barrel
87. Upper hand barrel	88. Upper hand barrel
89. Upper hand barrel	90. Upper hand barrel
91. Upper hand barrel	92. Upper hand barrel
93. Upper hand barrel	94. Upper hand barrel
95. Upper hand barrel	96. Upper hand barrel
97. Upper hand barrel	98. Upper hand barrel
99. Upper hand barrel	100. Upper hand barrel



25 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

- | | | |
|--|--------------------------|------------------------|
| ONE of Wood : | | |
| 1 Stock. | 17 Guard Plate, | 28 Lower Guard Screw. |
| ELEVEN principal metallic parts not otherwise mentioned : | | |
| 7 Receiver, | 18 Guard Bow, | TWO Pins : |
| 8 Locking Bolt, | 21 Trigger, | 22 Trigger Pin, |
| 11 Breech Bolt, | 23 Sear Bolt. | 24 Sear Bolt Pin. |
| 12 Recoil Block, | SEVEN Screws : | FOUR Springs : |
| 12 Firing Pin Guide, | 10 Locking Bolt Screw, | 9 Locking Bolt Spring, |
| 13 Firing Pin, | 19 Guard Bow Nut, | 14 Main Spring, |
| 16 Ejector, | 20 Guard Bow Nut, | 25 Trigger Spring, |
| | 43 Sear Bolt Stop Screw, | 15 Spring Extractor. |
| | 26 Trigger Spring Screw, | |
| | 27 Upper Guard Screw, | |

25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- | | | |
|---------------------------|----------------------------|------------------------------|
| 2 Barrel and Front Sight, | 32 Upper Band Swivel Scr., | 41 Rear Sight Leaf Screw, |
| 3 Ramrod, | 33 Lower Band, | 42 Rear Sight Joint Screw, |
| 4 Butt Plate, | 35 Lower Band Spring, | 44 Tip, |
| 5 Butt Plate Screw, | 36 Rear Sight Base, | 45 Tip Screw, |
| 6 Butt Plate Screw, | 37 Rear Sight Base Screw, | 18 Guard Bow Swivel and Pin, |
| 30 Upper Band, | 38 Rear Sight Spring, | 20 Ramrod Stop, Upper |
| 34 Upper Band Spring, | 39 Rear Sight Leaf, | 1 Ramrod Stop, Lower |
| 31 Upper Band Swivel, | 40 Rear Sight Leaf Slide, | |

WARD-BURTON, No. 26.

WARD-BURTON, No. 26.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By turning up the handle of the breech-bolt so as to disengage the threads of the sectional screw, and then withdrawing the bolt.

Closed.—By reversing the same, in so doing cocking the piece.

The motion of turning up the handle, in opening the piece, serves to revolve the firing-pin on its axis, and to cause a spiral shoulder near its head to bear against a corresponding surface into which the back of the firing-pin guide is formed. The point of the firing-pin is thus retracted from the face of the bolt in the closing of the piece, so as to avoid the accidental explosion of the cartridge during this operation. In turning down the handle these shoulders are no longer opposed, and the firing-pin may then be driven forward in the usual way. For a similar reason, the face of the bolt is made somewhat concave.

Locked.—By engaging the sectional male-screw thread on the bolt with the corresponding nut within the receiver.

Fired.—By a concealed lock moved by a spiral mainspring. The piece is cocked by compressing the mainspring by means of the firing-pin, which resting upon it, and catching on the sear-bolt in closing, is held back by it against the resistance of the mainspring, while the breech-bolt passes by, to the extent of the throw permitted the firing-pin. To fire the piece, the sear-bolt is drawn down out of the way by the trigger.

To prevent the sear-bolt from accidentally slipping off the shoulder on the firing-pin, when the mainspring is compressed, the surfaces in contact are internotched, the annular groove so formed on the firing-pin, being cut, so as to permit the passage of the sear-bolt, when the breech-bolt is turned down into the position of firing.

Extraction.—By a spring-hook recessed on top of the bolt, and riding over the rim of the cartridge in closing.

Ejection.—By a loose pin playing through the face of the bolt diametrically opposite to the extractor. This pin strikes the front of the sear-bolt in opening the piece. It thereby impinges against the lower edge of the cartridge-head, and throws the cartridge-shell upward around the hook of the extractor, by which it is held, until it is clear of the gun.

Half-cocked.—By the end of the locking-bolt engaging in a corresponding recess in the base of the handle of the breech-bolt, when it is released by the thumb and the handle turned up to meet it.

The piece may be dismounted by turning aside a stop-screw beneath the horizontal arm of the trigger. The sear-bolt may then be pulled down out of the slot in the bottom of the breech-bolt, so that the bolt may be withdrawn.

NOTE.—This is the arm issued for experimental trial in the field.

WARD-BURTON MAGAZINE-MUSKET, No. 97.

Three motions as a magazine, four motions as a single-loader. As a magazine-gun, opened, closed, fired; as a single loader, see No. 26.

Opened.—As in the musket before described. In drawing back the breech-bolt the front end of the slot in its lower surface strikes the upright lever-arm of the carrier and throws up the tray in which its forward part is formed. This tray supports a cartridge slantingly, so that the upper portion of the cartridge-head shall project slightly above the bottom of the groove in which the bolt slides, while the point of the bullet is opposite the mouth of the chamber. The carrier is kept in this position by the action of the carrier-lever spring.

Closed.—By reversing the movement of the bolt, its face catches against the head of the cartridge and shoves it up the incline of the carrier into the chamber. As its movement is completed the back end of the slot strikes the carrier-lever and forces down the carrier opposite the mouth of the magazine. In its descent it strikes a spring-catch magazine-stop operating to restrain the issue of the cartridges from the magazine, and allows one to come out upon the tray.

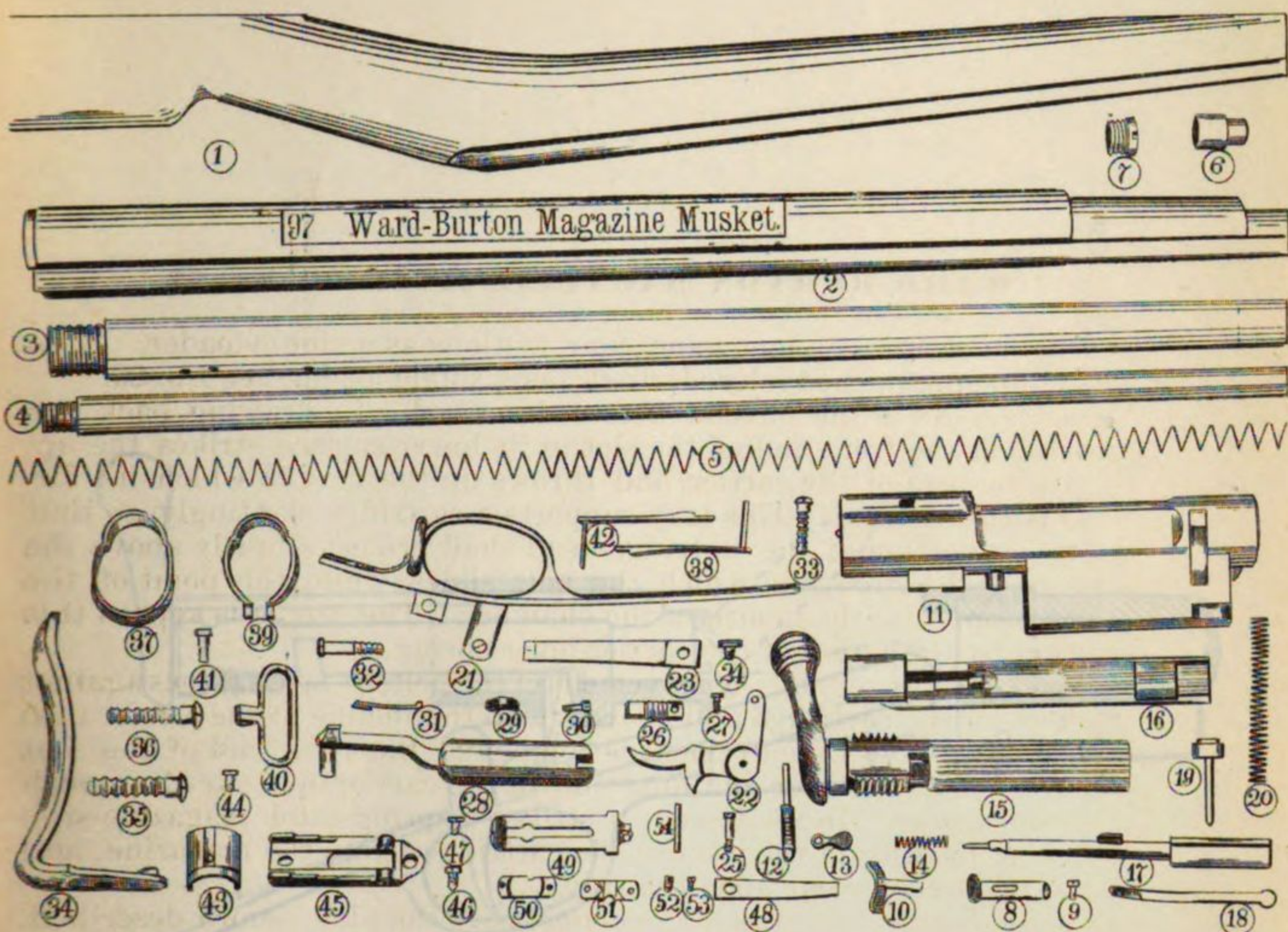
Fired—Locked—Ejection—Extraction.—By the plan before described.

The issue of cartridges from the magazine may be cut off by a slide operated by a projecting thumb-piece. The piece may then be used as a single-loader, holding the magazine in reserve.

The head of the follower is covered with India rubber in order to serve as a cushion for the rebound of the cartridges in firing.

The magazine is charged from below by drawing back the bolt, thus raising the carrier and exposing the mouth of the magazine for the successive introduction of the cartridges; when placed in the magazine the cartridges are retained there by the spring-catch above mentioned.

This arm uses a special ammunition, the general plan of which is that of the cup-anvil service-cartridge. The fulminate is protected from accidental ignition in the magazine by lying at the apex of a central pocket formed in the cartridge-head.



34 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 1 Butt Stock,
- 2 Tip Stock.

EIGHTEEN principal metallic parts not otherwise mentioned:

- 4 Magazine,
- 6 Magazine Follower,
- 8 Magazine Cut-Off,
- 10 Magazine Cut-Off Stop,
- 11 Receiver,
- 12 Locking Bolt,
- 13 Lock'g Bolt Thumb Piece,
- 15 Breech Bolt,
- 16 Recoil Block,
- 16 Firing Pin Guide,
- 17 Firing Pin,
- 18 Extractor,
- 19 Ejector Pin,
- 21 Guard Plate,
- 22 Trigger,
- 26 Sear Bolt,
- 28 Carrier,
- 29 Carrier Fly.

EIGHT Screws:

- 7 Mag. Spring Stop Screw,
- 9 Magazine Cut-Off Screw,
- 24 Trigger Spring Screw,
- 25 Trigger Screw,
- 27 Sear Bolt Screw,
- 30 Carrier Fly Screw,
- 32 Guard Screw, Upper
- 33 Guard Screw, Lower

FIVE Springs:

- 5 Magazine Spring,
- 14 Locking Bolt Spring,
- 20 Main Spring,
- 23 Trigger Spring,
- 31 Carrier Spring.

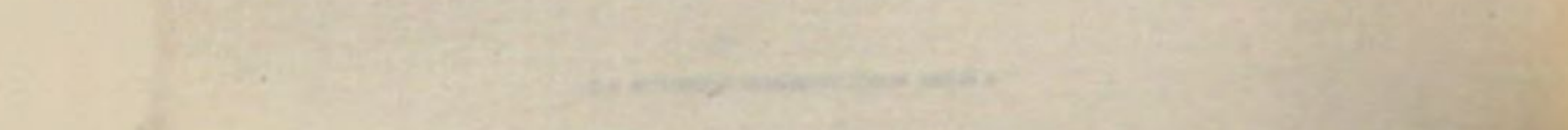
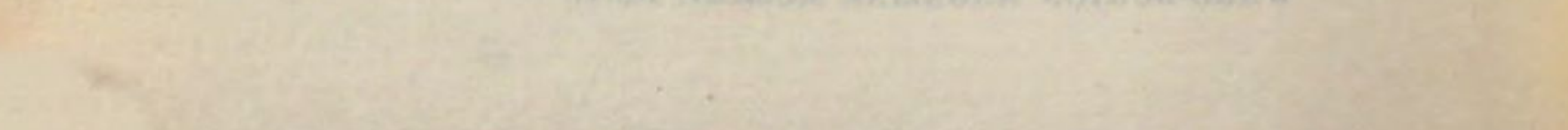
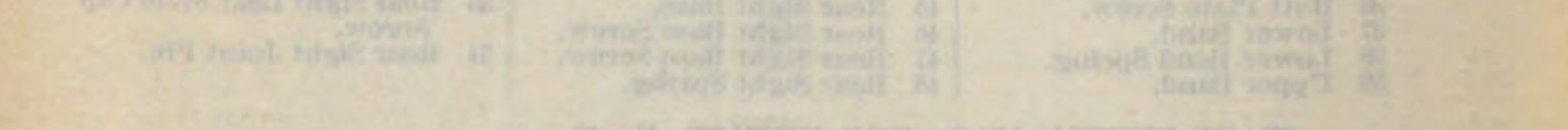
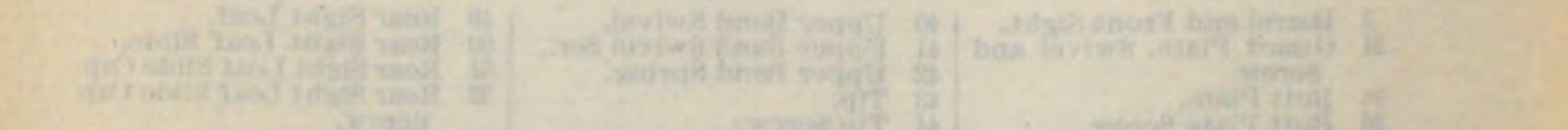
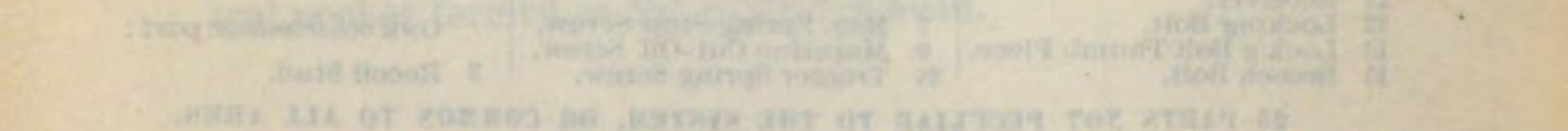
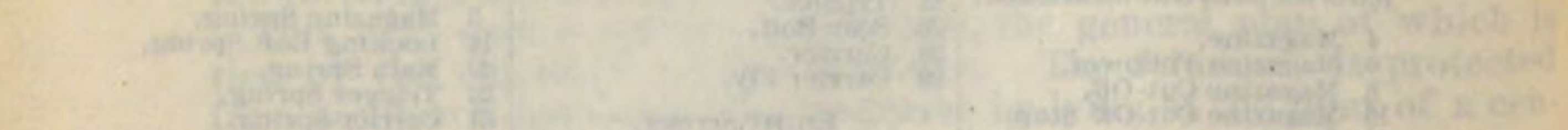
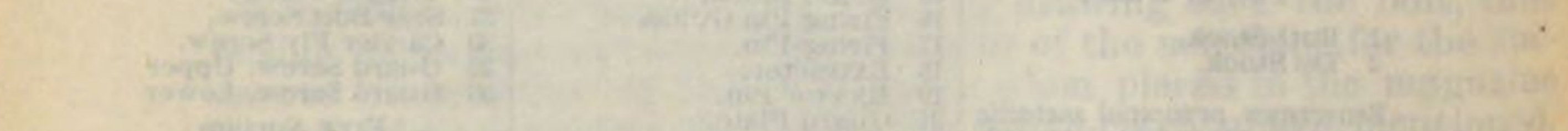
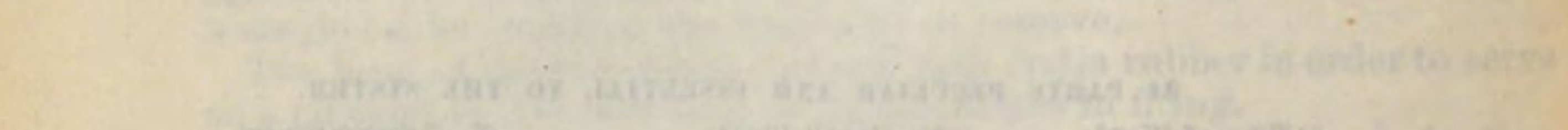
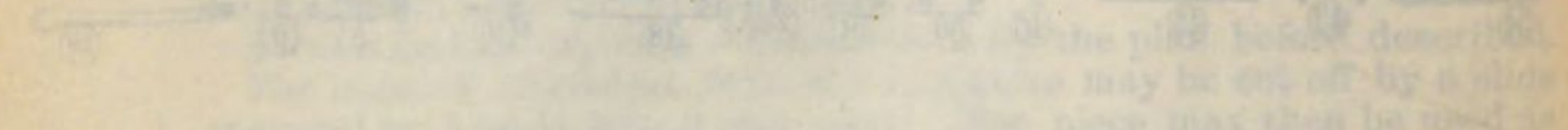
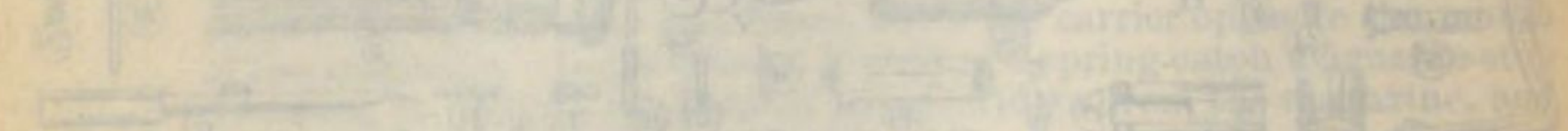
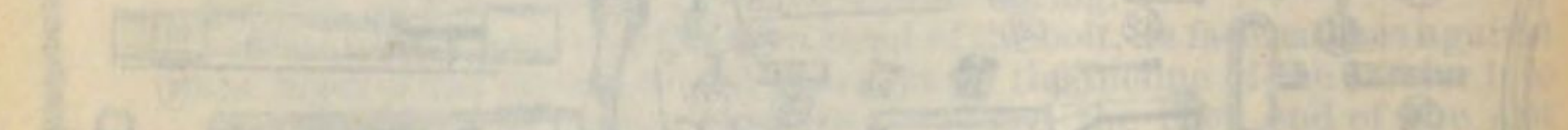
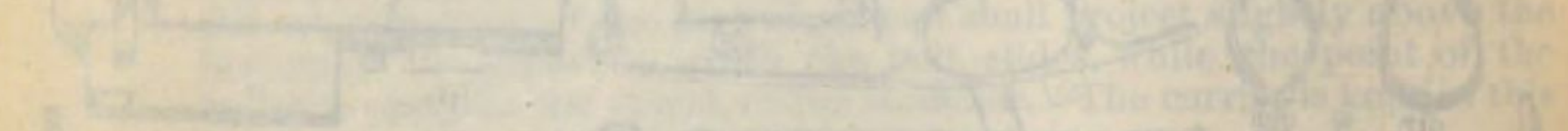
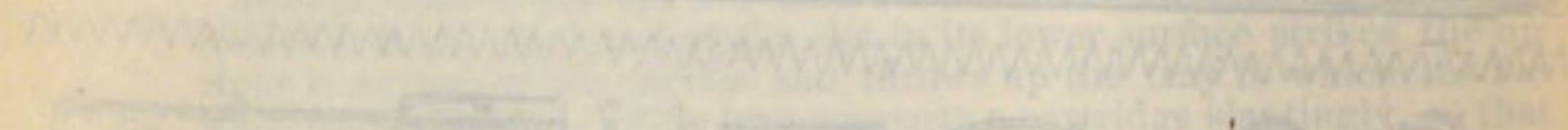
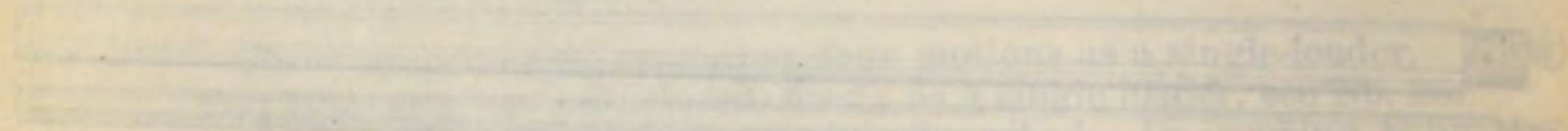
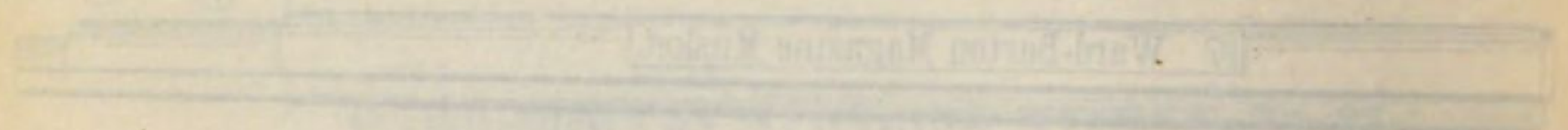
ONE other minor part:

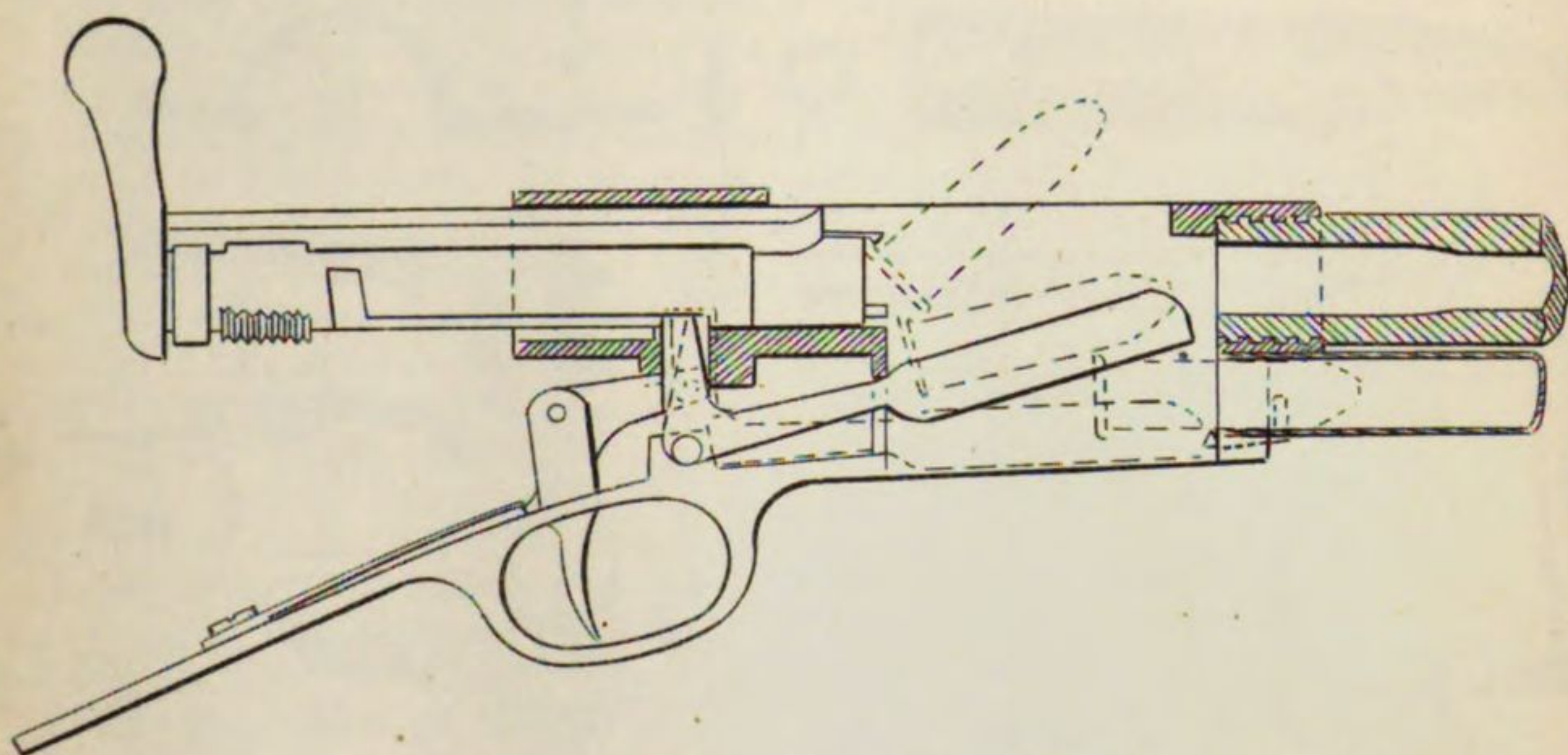
- 3 Recoil Stud.

25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

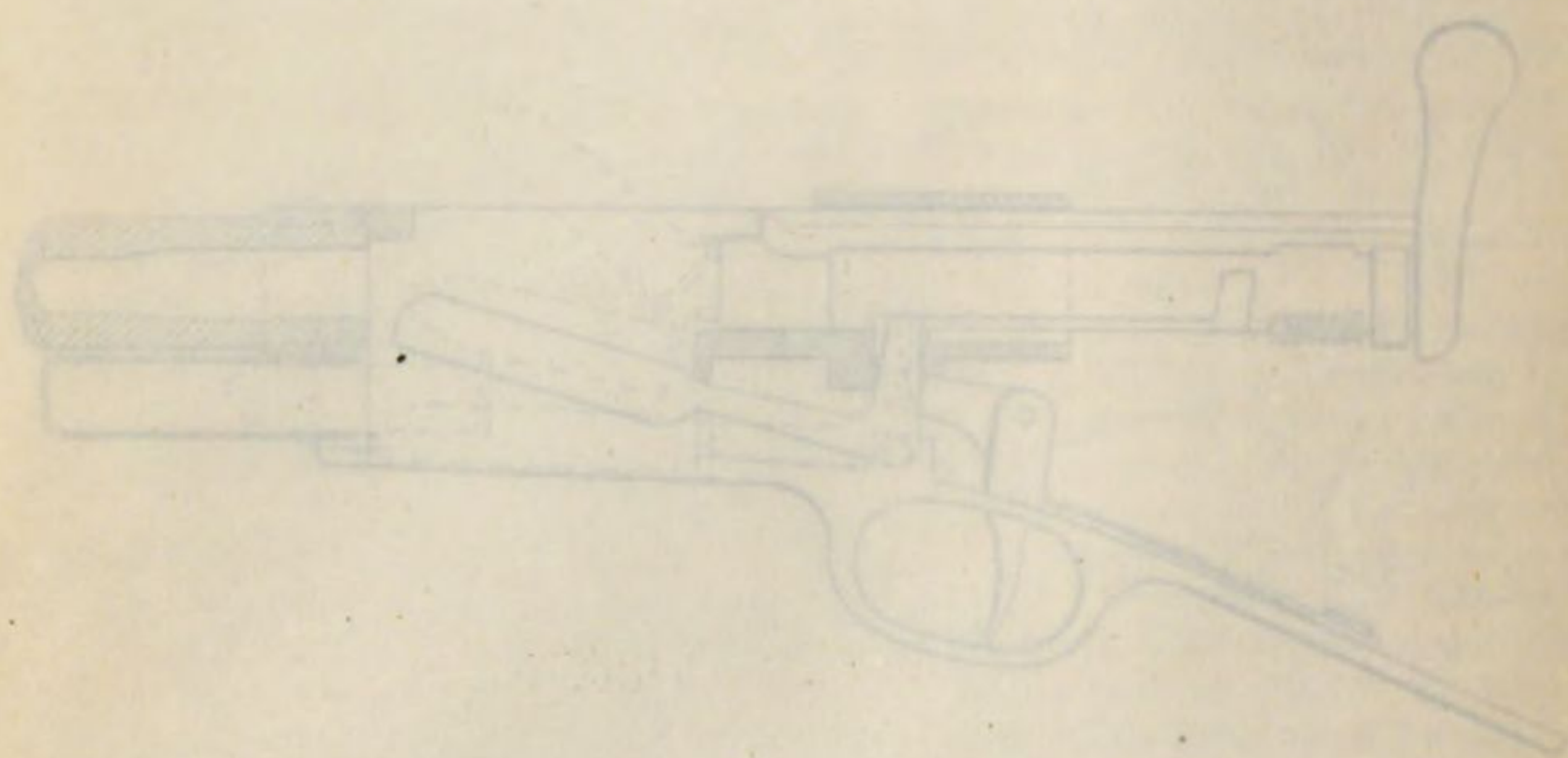
- 3 Barrel and Front Sight,
- 21 Guard Plate, Swivel and Screw,
- 34 Butt Plate,
- 35 Butt Plate Screw,
- 36 Butt Plate Screw,
- 37 Lower Band,
- 38 Lower Band Spring,
- 39 Upper Band,
- 40 Upper Band Swivel,
- 41 Upper Band Swivel Scr.,
- 42 Upper Band Spring,
- 43 Tip,
- 44 Tip Screw,
- 45 Rear Sight Base,
- 46 Rear Sight Base Screw,
- 47 Rear Sight Base Screw,
- 48 Rear Sight Spring,
- 49 Rear Sight Leaf,
- 50 Rear Sight Leaf Slide,
- 51 Rear Sight Leaf Slide Cap,
- 52 Rear Sight Leaf Slide Cap Screw,
- 53 Rear Sight Leaf Slide Cap Screw,
- 54 Rear Sight Joint Pin.

WARD-BURTON MAGAZINE MUSKET, No. 97.





97 Ward-Burton Magazine Musket.



07. Ward-Button Magazine Pistol

WATER.

From position (1) to (2) Opened; loaded; closed; fired.

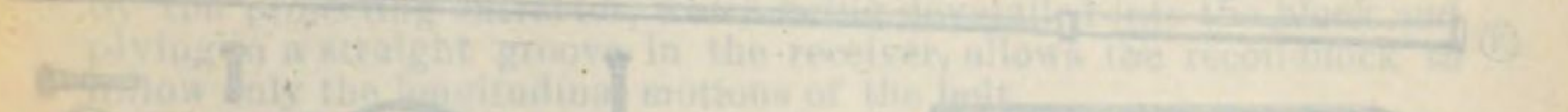
Opened.—By raising the handle of the breech-bolt to a vertical position and withdrawing it. It brings back to its original position the breech-block, over a projection in which an undercut groove in the forward tip of the bolt, has been engaged by the rear of the breech-block.



It is not in itself a locking device, but it is a safety device, preventing the breech-block from falling forward.



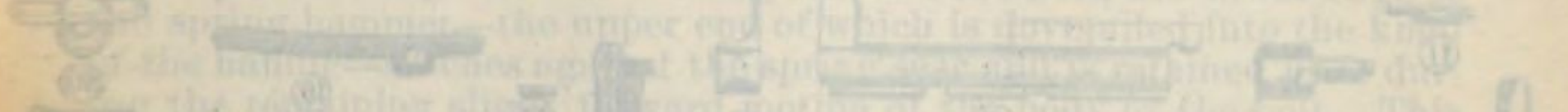
The breech-block when in its closed position is held from falling forward by the action of the breech-lock.



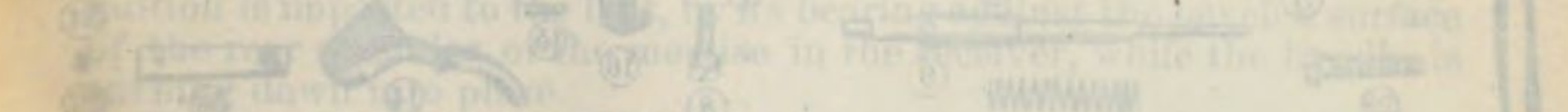
The breech-lock when in its open position is held from falling forward by the action of the breech-lock.



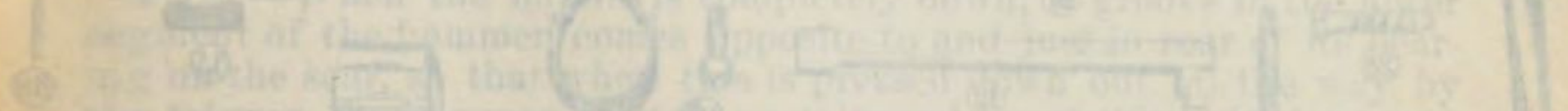
The breech-lock when in its closed position is held from falling forward by the action of the breech-lock.



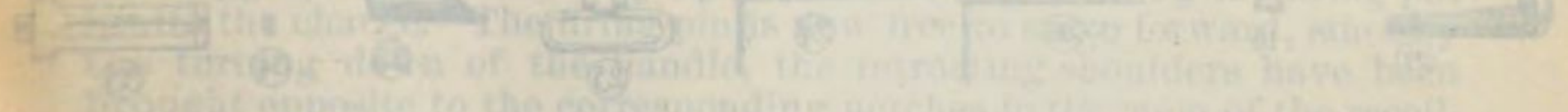
The breech-lock when in its open position is held from falling forward by the action of the breech-lock.



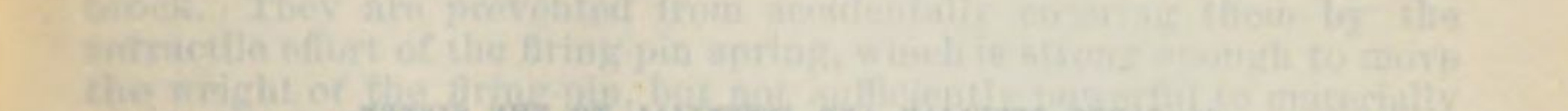
The breech-lock when in its closed position is held from falling forward by the action of the breech-lock.



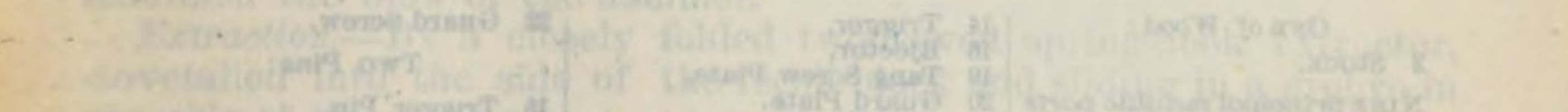
The breech-lock when in its open position is held from falling forward by the action of the breech-lock.



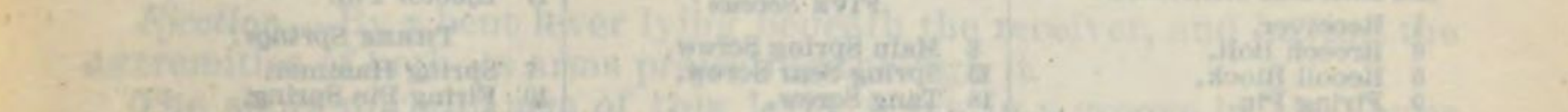
The breech-lock when in its closed position is held from falling forward by the action of the breech-lock.



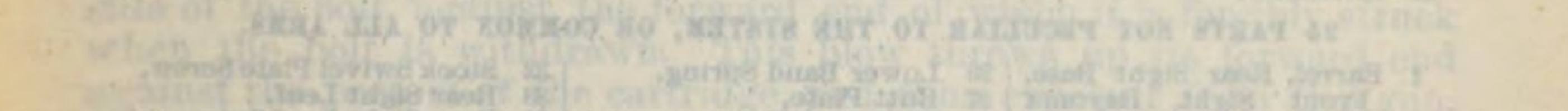
The breech-lock when in its open position is held from falling forward by the action of the breech-lock.



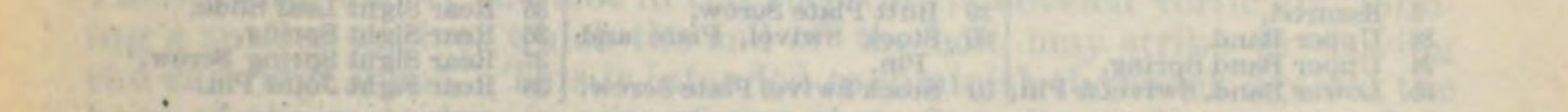
The breech-lock when in its closed position is held from falling forward by the action of the breech-lock.



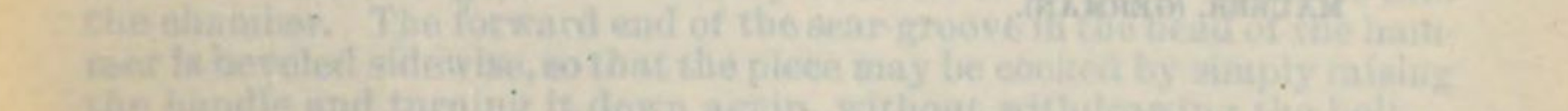
The breech-lock when in its open position is held from falling forward by the action of the breech-lock.



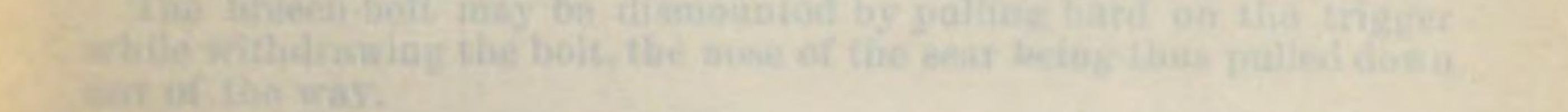
The breech-lock when in its closed position is held from falling forward by the action of the breech-lock.



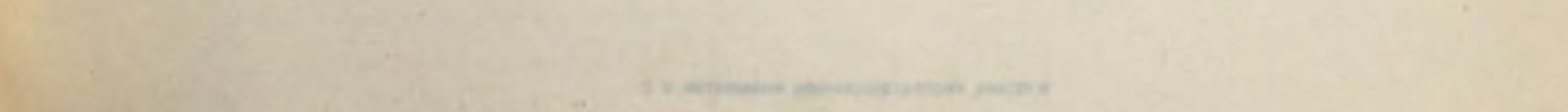
The breech-lock when in its open position is held from falling forward by the action of the breech-lock.



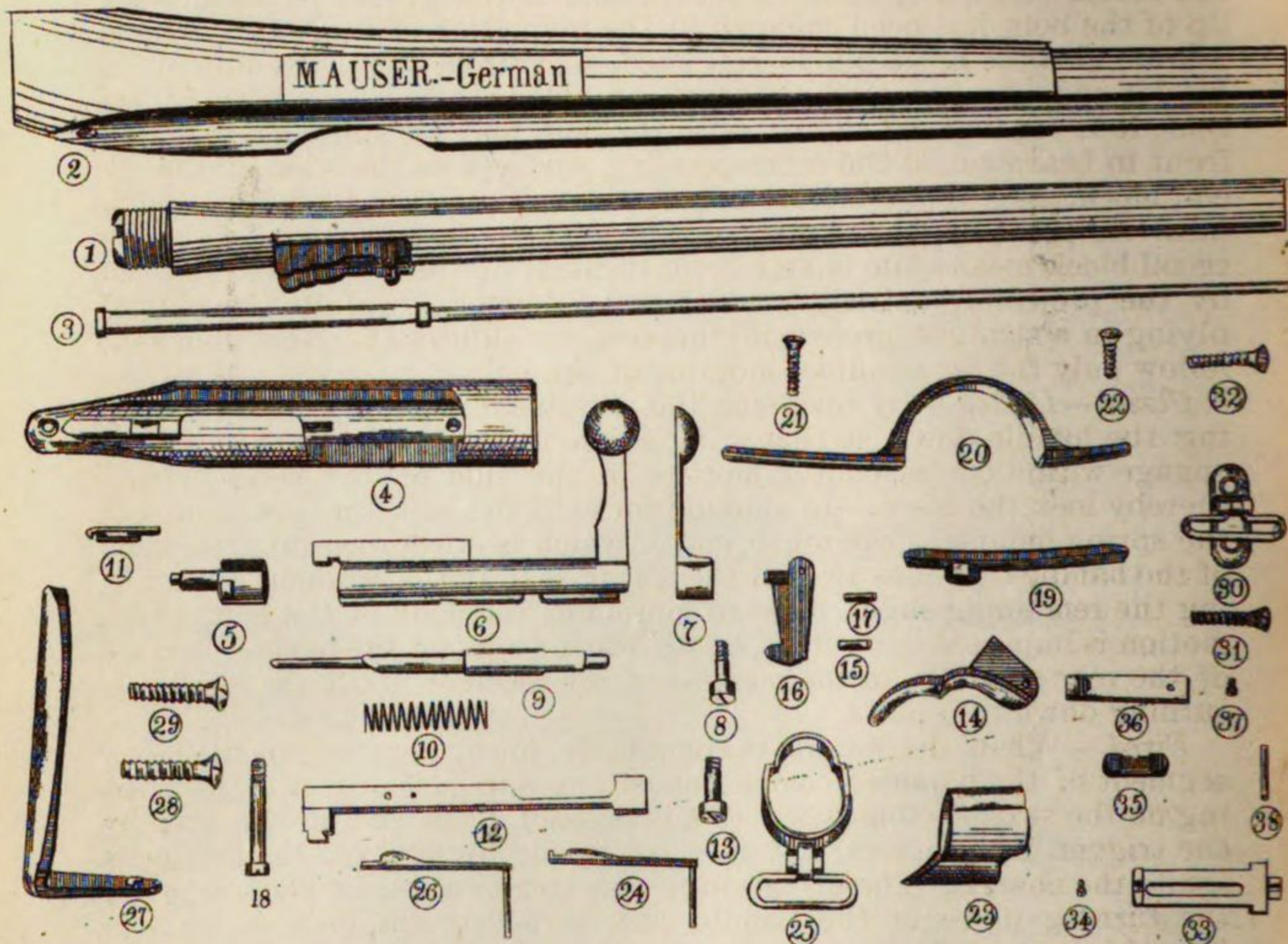
The breech-lock when in its closed position is held from falling forward by the action of the breech-lock.



The breech-lock when in its open position is held from falling forward by the action of the breech-lock.



The breech-lock when in its closed position is held from falling forward by the action of the breech-lock.



20 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

- ONE of Wood :
- 2 Stock.
- NINE principal metallic parts not otherwise mentioned :
- 4 Receiver,
6 Breech Bolt,
5 Recoil Block,
9 Firing Pin,
11 Extractor,

- 14 Trigger,
16 Ejector,
19 Tang Screw Plate,
20 Guard Plate.

FIVE Screws :

- 8 Main Spring Screw,
13 Spring Sear Screw,
18 Tang Screw,
21 Guard Screw,

- 22 Guard Screw.

TWO Pins :

- 15 Trigger Pin,
17 Ejector Pin.

THREE Springs :

- 7 Spring Hammer,
10 Firing Pin Spring,
12 Spring Sear.

25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel, Rear Sight Base, Front Sight, Bayonet Stud,
3 Ramrod,
23 Upper Band,
24 Upper Band Spring,
25 Lower Band, Swivel & Pin,

- 26 Lower Band Spring,
27 Butt Plate,
28 Butt Plate Screw,
29 Butt Plate Screw,
30 Stock Swivel, Plate and Pin,
31 Stock Swivel Plate Screw,

- 32 Stock Swivel Plate Screw,
33 Rear Sight Leaf,
34 Rear Sight Leaf Screw,
35 Rear Sight Leaf Slide,
36 Rear Sight Spring,
37 Rear Sight Spring Screw,
38 Rear Sight Joint Pin.

MAUSER. (GERMAN).

MAUSER.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By raising the handle of the breech-bolt to a vertical position and then withdrawing it. It brings back at the same time the recoil-block, over a projection on which, an undercut groove in the forward lip of the bolt, has been engaged by the revolution of the bolt. By this motion also the firing-pin is retracted, since from the flattening of its hinder end, and its passing through an oblong hole in the base of the bolt, it is constrained to turn with the bolt, and the spiral shoulders in front to bear against the corresponding surfaces on the stem of the recoil-block, and by the helical motion thus obtained to force itself back until its point no longer protrudes beyond the face of the block. The recoil-block meanwhile is kept from turning, by the resistance afforded by the projecting extractor, which being dovetailed into the block and plying in a straight groove in the receiver, allows the recoil-block to follow only the longitudinal motions of the bolt.

Closed—Locked.—By reversing the movement of the bolt and turning the handle down, so that a lug at the forward end of the bolt shall engage with a corresponding mortise in the side of the receiver and thereby lock the piece. In shoving forward the bolt, the lower edge of the spring-hammer—the upper end of which is dovetailed into the knob of the handle—catches against the spring-sear and is retained by it during the remaining slight forward motion of the body of the bolt. This motion is imparted to the bolt, by its bearing against the beveled surface of the rear shoulder of the mortise in the receiver, while the handle is turning down into place.

Fired.—When the handle is completely down, a groove in the lower segment of the hammer comes opposite to and just in rear of its bearing on the sear, so that when this is pressed down out of the way by the trigger, the hammer may fly past it, and by striking the firing-pin ignite the charge. The firing-pin is now free to move forward, since by the turning down of the handle, the retracting-shoulders have been brought opposite to the corresponding notches in the stem of the recoil-block. They are prevented from accidentally entering them by the retractile effort of the firing-pin spring, which is strong enough to move the weight of the firing-pin, but not sufficiently powerful to materially diminish the blow of the hammer.

Extraction.—By a closely folded two-leaved spring-hook extractor, dovetailed into the side of the recoil-block and sliding in a groove in the side of the receiver.

Ejection.—By a bent lever lying beneath the receiver, and having the extremities of both its arms projecting through it.

The short upright arm of this lever plays in a groove in the lower side of the bolt, against the forward end of which it is forcibly struck when the bolt is withdrawn. This blow throws up its forward end against the bottom of the cartridge, and thus expels it from the gun. The forward end of the slot in the receiver is beveled vertically, forming a surface against which the end of the bolt may strike in driving the cartridge home. This is intended to diminish the shock against the base of the cartridge, in case of any obstacle to its ready entrance into the chamber. The forward end of the sear-groove in the head of the hammer is beveled sidewise, so that the piece may be cocked by simply raising the handle and turning it down again, without withdrawing the bolt.

The breech-bolt may be dismounted by pulling hard on the trigger while withdrawing the bolt, the nose of the sear being thus pulled down out of the way.

VETTERLIN MAGAZINE-MUSKET.—SWISS.

Three motions as a magazine-gun, four as a single-loader, viz: Opened, closed, and fired; and opened, loaded, closed, and fired.

Opened.—By turning up the handle, a pair of spiral cam-shaped surfaces on the interior of the annular body to which it is attached, bears against each arm of the cross-piece on the firing-bolt, and forces it backward against the pressure of the spiral mainspring. This spring surrounds the back portion of the breech-bolt, and abuts against the stop-nut screwed on its rearmost extremity.

When the upward motion of the handle is completed, the spring has been compressed to its full extent, and is kept under tension by the face of the cross-piece leaving the inclined surface of the spiral cam and bearing against the square end of the body of the cam-lever.

The bolt may then be withdrawn in the usual way. At the conclusion of its movement, when no longer obstructing the well of the receiver by lying over it, the end of the groove on its under side strikes against the upright arm of the carrier-lever and throws up its horizontal arm, bearing with it the carrier which supports the cartridge for the next discharge. The breech may then be closed.

Closed.—By reversing the movement of the bolt. In so doing the cartridge is passed into the chamber. When the breech is fully closed, the rearmost end of the groove above referred to, striking the back of the upright arm of the carrier-lever, forces it down into place. It carries with it the carrier to receive from the magazine a fresh cartridge, which is fed down upon it by the magazine-spring.

In then turning down the handle to its original position its body leaves the cross-piece of the firing-bolt, which is now supported against the stress of the mainspring, by its notched arm being engaged with the top of the sear-bolt.

Locked.—By two lugs on the body of the cam-lever, which, in turning down the handle after closing the piece, engage with corresponding recesses in the frame, after the manner of a sectional screw.

Fired.—By pulling down the sear-bolt with the trigger, and thus allowing the firing-bolt to be forcibly impelled against the double-pointed firing-pin, which explodes the charge.

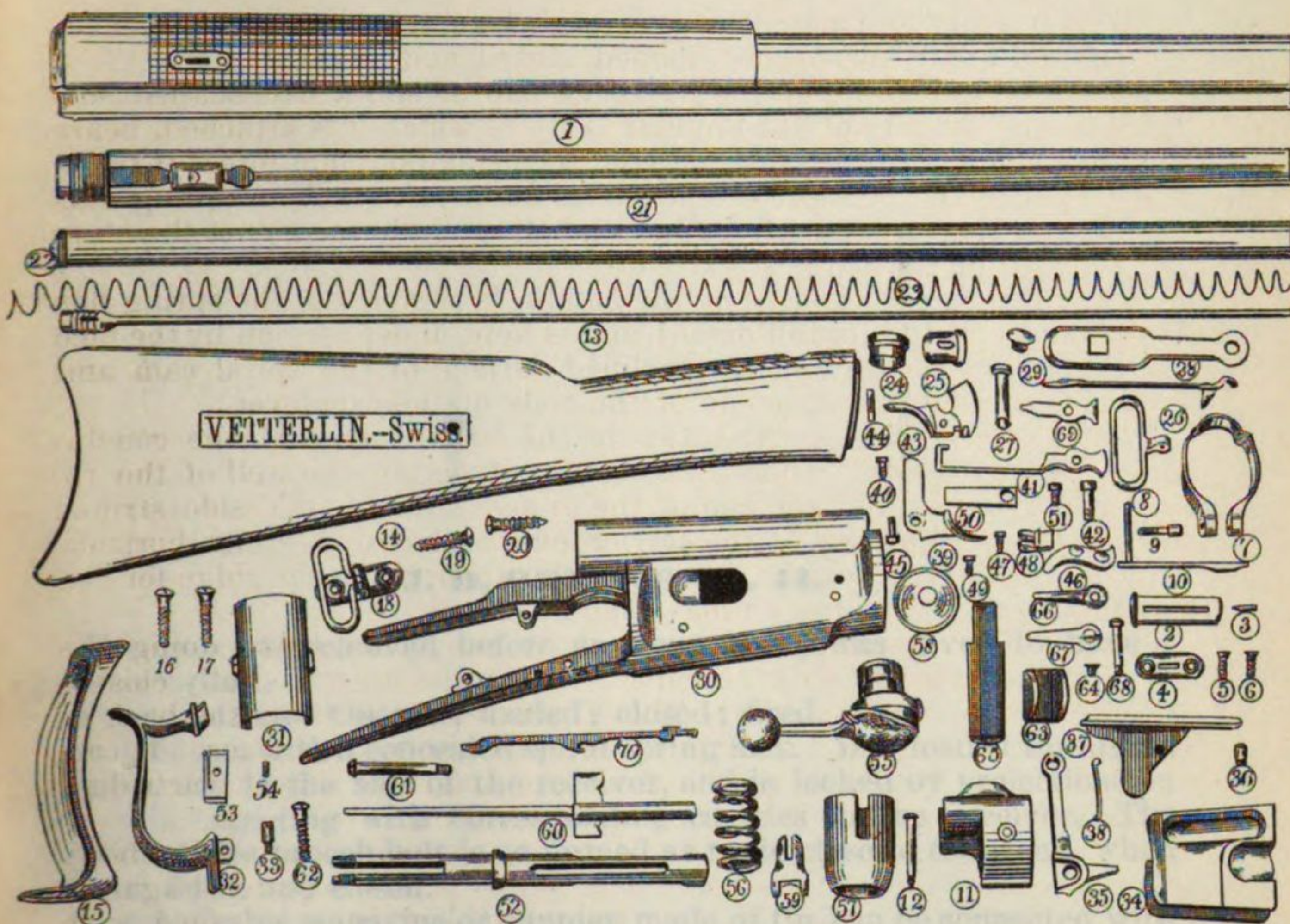
Extraction.—By the usual spring-hook lying on top of the breech-bolt.

Ejection.—By the bottom of the shell being forcibly struck by the rising carrier, at the moment of its complete withdrawal from the chamber.

The magazine is charged through a hole in the side of the frame, which is covered by a swinging lid, and which communicates through a corresponding hole in the side of the carrier with the mouth of the magazine. The magazine can be cut off and held in reserve when the arm is to be used as a single loader, by blocking the exit of the cartridges at its mouth by means of a transverse arm attached to a lever swinging on the outside of the frame. The cartridges are then introduced singly into the carrier in the usual way. The covers for the well of the receiver and for the mainspring are of sheet iron, and are intended to protect the parts from rain or dust.

The set trigger represented in the photograph is not an invariable adjunct of the arm.

The arm uses a bottle-necked rim-fire cartridge of small capacity.



45 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 1 Tip Stock,
- 14 Butt Stock.

TWENTY-ONE principal metallic parts not otherwise mentioned:

- 2 Recoil Stop,
- 22 Magazine,
- 25 Magazine Follower,
- 26 Magazine Cut-off,
- 28 Loading Lid,
- 30 Receiver,
- 32 Guard Bow,
- 34 Carrier,
- 35 Carrier Lever,
- 37 Carrier Lever Plate,
- 39 Trigger,
- 46 Sear,

- 48 Sear Bolt,
- 52 Breech Bolt,
- 53 Breech Bolt Stop,
- 55 Breech Bolt Cam Lever,
- 57 Main Spring Cover,
- 58 Main Spring Stop,
- 59 Firing Pin,
- 60 Firing Bolt,
- 24 Magazine Spring Stop.

TWELVE Screws:

- 27 Magazine Cut-off Spring Screw,
- 29 Loading Lid Screw,
- 33 Guard Bow Screw,
- 36 Carrier Lever Screw,
- 40 Trigger Screw,
- 42 Trigger Spring Screw,
- 47 Sear Screw,

- 49 Sear Bolt Screw,
- 51 Sear Spring Screw,
- 54 Breech Bolt Stop Screw,
- 61 Tang Screw,
- 62 Guard Screw.

Two Pins:

- 3 Recoil Pin Stop Pin,
- 52 Spring Extractor Pin.

SEVEN Springs:

- 23 Magazine Spring,
- 26 Magazine Cut-off Spring,
- 38 Carrier Lever Spring,
- 41 Trigger Spring,
- 50 Sear Spring,
- 56 Main Spring,
- 70 Spring Extractor.

ONE other minor part:

- 31 Receiver Slide Cover.

29 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 4 Escutcheon,
- 5 Escutcheon Screw,
- 6 Escutcheon Screw,
- 7 Lower Band,
- 8 Lower Band Swivel,
- 9 Lower Band Screw,
- 10 Lower Band Spring,
- 11 Upper Band,
- 12 Upper Band Spring,
- 13 Ramrod,

- 15 Butt Plate,
- 16 Butt Plate Screw,
- 17 Butt Plate Screw,
- 18 Butt Stock Swivel Plate and Swivel,
- 19 Butt Stock Swivel Plate Screw,
- 20 Butt Stock Swivel Plate Screw,
- 21 Barrel and Front Sight,

- 63 Rear Sight Base,
- 64 Rear Sight Base Screw,
- 65 Rear Sight Leaf,
- 66 Rear Sight Spring,
- 67 Rear Sight Spring,
- 68 Rear Sight Joint Screw,
- 43 Set Trigger,
- 44 Set Trigger Pin,
- 45 Set Trigger Stop Screw,
- 69 Set Trigger Spring.

VETTERLIN, (SWISS).

THE NEW YORK

THE NEW YORK



THE NEW YORK

1. The ship	2. The ship	3. The ship	4. The ship	5. The ship	6. The ship	7. The ship	8. The ship	9. The ship	10. The ship	11. The ship	12. The ship	13. The ship	14. The ship	15. The ship	16. The ship	17. The ship	18. The ship	19. The ship	20. The ship	21. The ship	22. The ship	23. The ship	24. The ship	25. The ship	26. The ship	27. The ship	28. The ship	29. The ship	30. The ship	31. The ship	32. The ship	33. The ship	34. The ship	35. The ship	36. The ship	37. The ship	38. The ship	39. The ship	40. The ship	41. The ship	42. The ship	43. The ship	44. The ship	45. The ship	46. The ship	47. The ship	48. The ship	49. The ship	50. The ship	51. The ship	52. The ship	53. The ship	54. The ship	55. The ship	56. The ship	57. The ship	58. The ship	59. The ship	60. The ship	61. The ship	62. The ship	63. The ship	64. The ship	65. The ship	66. The ship	67. The ship	68. The ship	69. The ship	70. The ship	71. The ship	72. The ship	73. The ship	74. The ship	75. The ship	76. The ship	77. The ship	78. The ship	79. The ship	80. The ship	81. The ship	82. The ship	83. The ship	84. The ship	85. The ship	86. The ship	87. The ship	88. The ship	89. The ship	90. The ship	91. The ship	92. The ship	93. The ship	94. The ship	95. The ship	96. The ship	97. The ship	98. The ship	99. The ship	100. The ship
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J. D. GREENE, No. 14.

This gun was removed before an opportunity was given to have it photographed.

Four motions : Opened ; loaded ; closed ; fired.

A bolt-gun with a concealed spiral-spring lock. It is loaded through a mortise cut in the side of the receiver, and is locked by projections on the bolt engaging with corresponding cavities in the receiver. The handle of the breech bolt is so formed as to lie close to the stock, when turned down and closed.

A detachable magazine or pannier, made of tin, can be connected with the right side of the receiver, and is worked by canting the gun to the left, and allowing a cartridge to roll into the receiver in front of the bolt, when it is withdrawn to load.

MILBANK, No. 51.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By raising the handle of the breech-bolt from its recoil-bearing in the receiver, and then drawing back the bolt.

Closed.—By reversing the action of the bolt; the hammer-bolt striking the sear-bolt in closing, and thereby compressing the spiral mainspring which surrounds its rear portion.

Locked.—By the support afforded the base of the handle by its bearing on the recoil-shoulder of the receiver when the piece is closed.

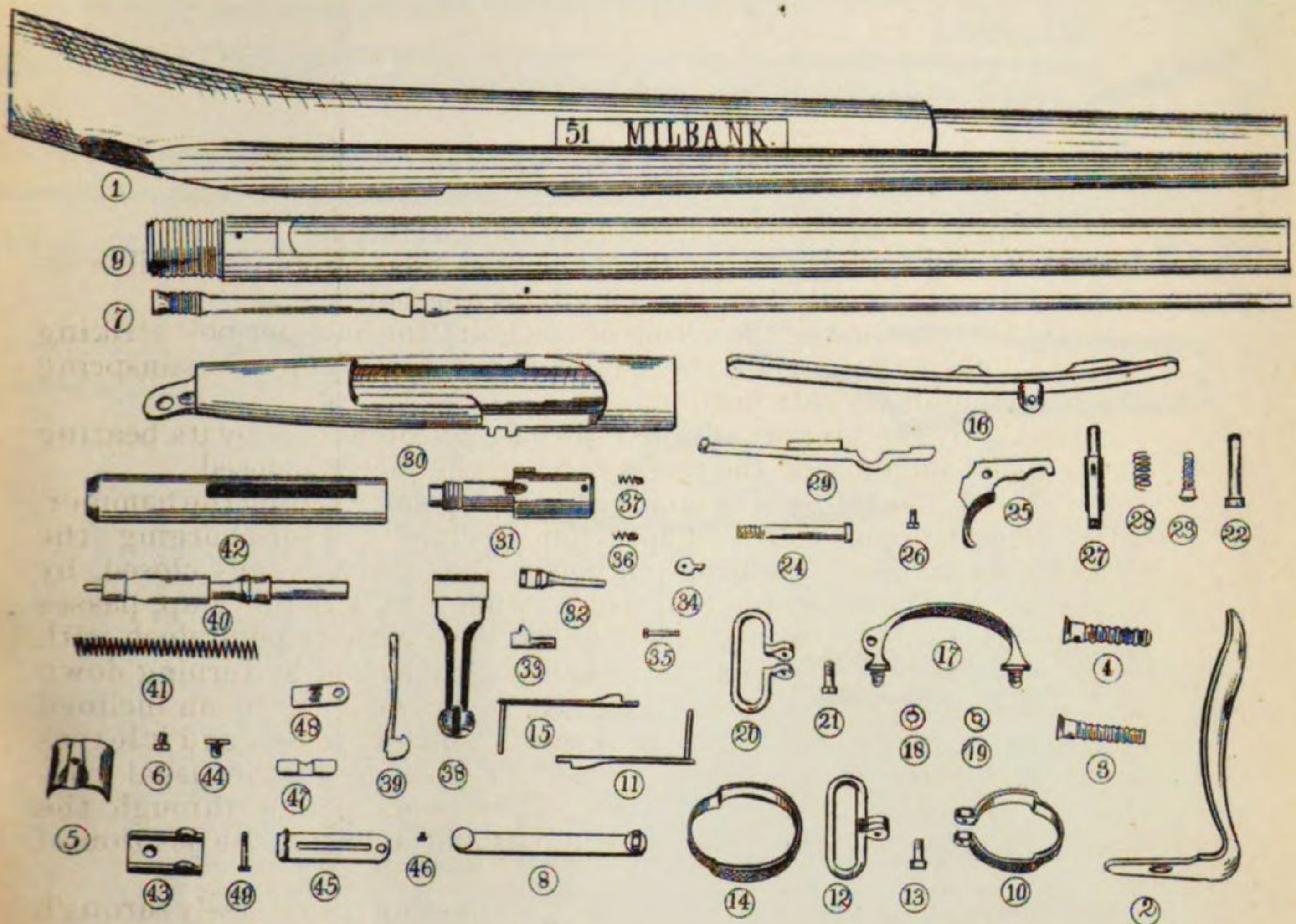
Fired.—By the action of a spiral mainspring surrounding the hammer-bolt. The hammer-bolt is kept from accidentally discharging the cartridge by striking the firing-pin before the breech is fully closed, by means of a transverse stop-pin, which, when the handle is up, passes through the firing-pin and keeps it forced back with its point flush with the face of the bolt. When the breech is fully locked by turning down the handle into place, the transverse pin is drawn back by an inclined surface in the hole of the firing-pin through which it passes, and it leaves the firing-pin free to be driven forward at pleasure in the usual way. The rear end of the firing-bolt when drawn back passes through the base of the rear section of the breech-bolt and indicates the position of cocked.

Extraction.—By a hook swinging on a pin passing transversely through the recoil-block near its face.

Ejection.—By the action of a spiral spring set in the face of the bolt and pressing against the lower edge of the cartridge-head until the shell is clear of the chamber. The shell being then free to turn, is rotated around the hook by which it is held and is thrown clear of the gun.

A safety-lever is connected with this arm and serves to dispense with the necessity of a half-cock notch; a projection on its under surface passes through the guard-strap in rear of the bow, and before firing, is to be pressed upward with the outside fingers of the hand, so as to liberate its forward end from its position behind the trigger, which until this has been done is immovably locked.

The accidental opening of the breech may be prevented by turning up the handle part way and pressing down its stop-pin; the point of this passes into a hole in the side of the recoil-block, and thus prevents the revolution of the entire bolt.



26 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

1 Stock.

THIRTEEN principal metallic parts not otherwise mentioned :

16 Guard Plate,
17 Guard Bow,
25 Trigger,
27 Sear Bolt,
30 Receiver,
31 Recoil Block,
32 Firing Pin,

33 Firing Pin Stop Pin,
34 Extractor,
38 Handle,
39 Handle Stop Pin,
40 Hammer Bolt,
42 Breech Bolt.

SIX Screws :

18 Guard Bow Nut,
19 Guard Bow Nut,
22 Guard Plate Scr., Upper
23 Guard Plate Scr., Lower
24 Tang Screw,

26 Trigger Screw.

ONE Pin :

35 Extractor Pin.

FOUR Springs :

28 Sear Bolt Spring,
36 Extractor Spring,
37 Ejector Spring,
41 Main Spring.

ONE other minor part :

29 Safety Lever.

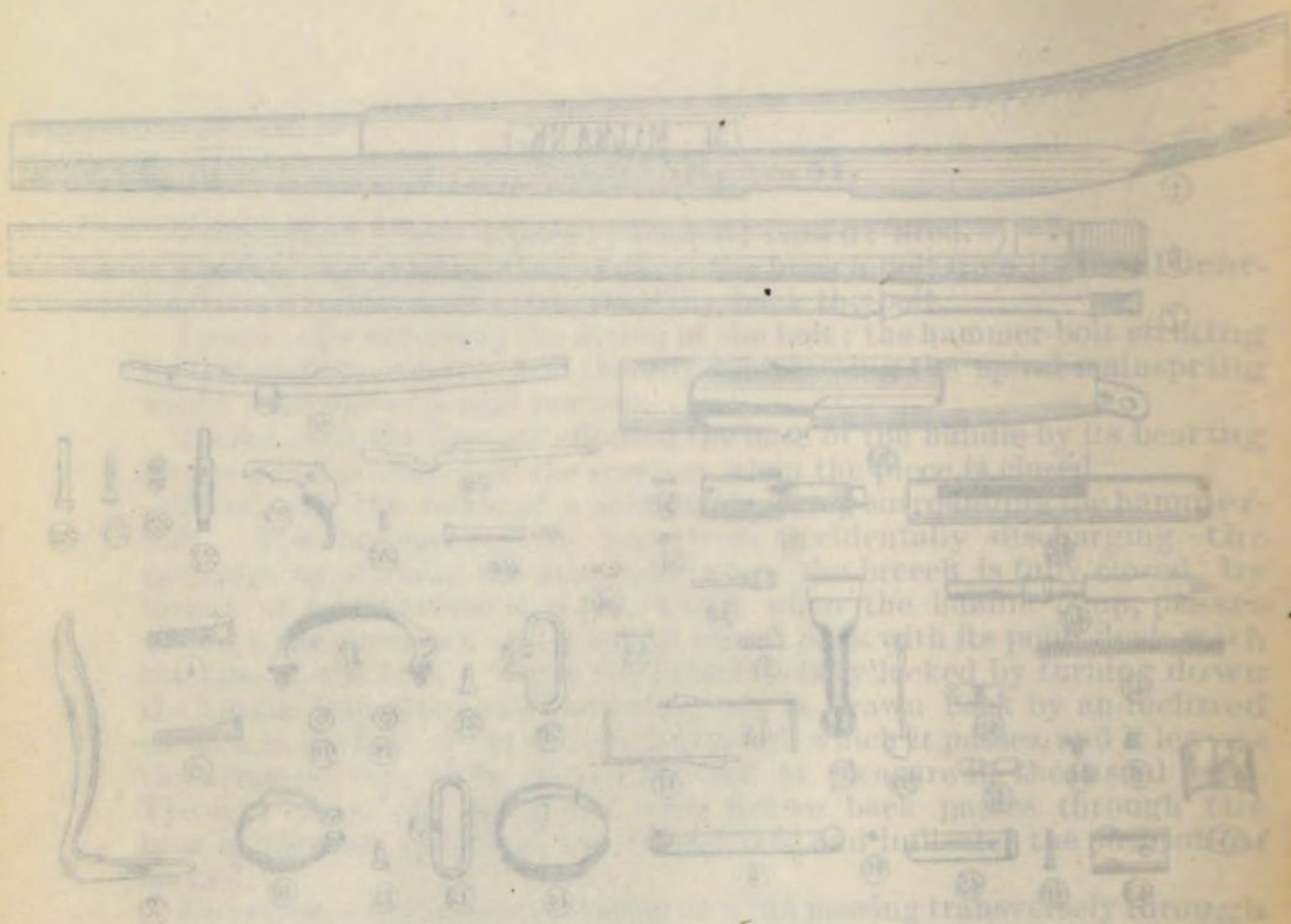
24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Butt Plate,
3 Butt Plate Screw,
4 Butt Plate Screw,
5 Tip,
6 Tip Screw,
7 Ramrod,
8 Ramrod Stop,
9 Barrel and Front Sight,

10 Upper Band,
11 Upper Band Spring,
12 Upper Band Swivel,
13 Upper Band Screw,
14 Lower Band,
15 Lower Band Spring,
20 Guard Swivel,
21 Guard Swivel Screw,

43 Rear Sight Base,
44 Rear Sight Base Screw,
45 Rear Sight Leaf,
46 Rear Sight Leaf Screw,
47 Rear Sight Leaf Slide,
48 Rear Sight Spring,
49 Rear Sight Leaf Joint Screw.

MILBANK, No. 51.



1	Large screw	11	Small screw
2	Large screw	12	Small screw
3	Large screw	13	Small screw
4	Large screw	14	Small screw
5	Large screw	15	Small screw
6	Large screw	16	Small screw
7	Large screw	17	Small screw
8	Large screw	18	Small screw
9	Large screw	19	Small screw
10	Large screw	20	Small screw
21	Large screw	31	Small screw
22	Large screw	32	Small screw
23	Large screw	33	Small screw
24	Large screw	34	Small screw
25	Large screw	35	Small screw
26	Large screw	36	Small screw
27	Large screw	37	Small screw
28	Large screw	38	Small screw
29	Large screw	39	Small screw
30	Large screw	40	Small screw
41	Large screw	42	Small screw
43	Large screw	44	Small screw
45	Large screw	46	Small screw
47	Large screw	48	Small screw
49	Large screw	49	Small screw
50	Large screw	50	Small screw

NAVY DEPARTMENT

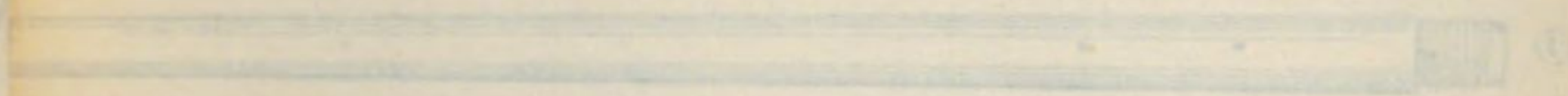


FIG. 1.



FIG. 2.



FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

FIG. 13.

FIG. 14.

FIG. 15.

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FIG. 35.

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FIG. 42.

FIG. 43.

FIG. 44.

FIG. 45.

FIG. 46.

FIG. 47.

FIG. 48.

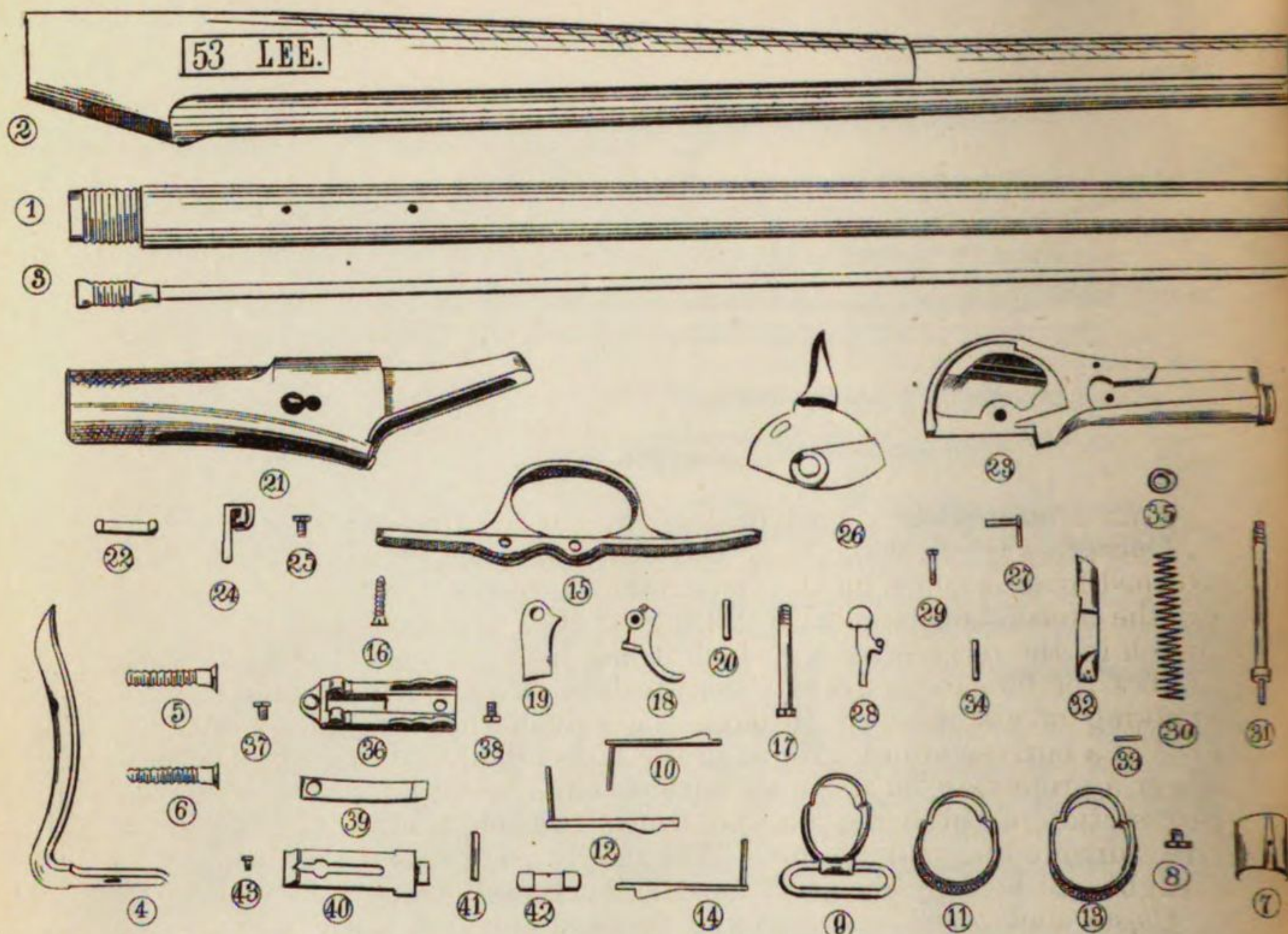
FIG. 49.

FIG. 50.

IS PART NOT PECULIAR TO THE SYSTEM OR COMMON TO ALL THEM.

1	Front and front right	1	Upper hand screw & pin	37	Lower right hand screw
2	Front	2	Lower hand screw	38	Lower right hand screw
3	Front plate	3	Upper hand screw	39	Lower right hand screw
4	Front plate screw	4	Lower hand screw	40	Lower right hand screw
5	Front plate screw	5	Upper hand screw	41	Lower right hand screw
6	Front plate screw	6	Lower hand screw	42	Lower right hand screw
7	Tip	7	Upper hand screw	43	Lower right hand screw
8	Tip screw	8	Lower hand screw	44	Lower right hand screw

FIG. 50.



22 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

2 Stock.

ELEVEN principal metallic parts not otherwise mentioned :

15 Guard,
18 Trigger,
19 Trigger Bolt,
21 Receiver,
22 Extractor,
23 Breech Bolt,

26 Cam Lever,
28 Sear,
31 Firing Pin Section, Lower
32 Firing Pin Section, Upper
35 Firing Pin Washer.

THREE Screws :

16 Guard Screw,
17 Tang Screw,
25 Breech Bolt Locking Bolt
Screw.

SIX Pins :

20 Trigger Pin,
24 Breech Bolt Stop Pin,
27 Cam Lever Stop Pin,
29 Sear Pin,
33 Firing Pin Section Pin,
34 Firing Pin Stop Pin.

ONE Spring :

30 Main Spring.

23 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

1 Barrel and Front Sight,
3 Ramrod,
4 Butt Plate,
5 Butt Plate Screw,
6 Butt Plate Screw,
7 Tip,
8 Tip Screw,

9 Upper Band, Swivel & Pin,
10 Upper Band Spring,
11 Middle Band,
12 Middle Band Spring,
13 Lower Band,
14 Lower Band Spring,
36 Rear Sight Base,

37 Rear Sight Base Screw,
38 Rear Sight Base Screw,
39 Rear Sight Spring,
40 Rear Sight Leaf,
41 Rear Sight Joint Pin,
42 Rear Sight Leaf Slide,
43 Rear Sight Leaf Screw.

LEE, No. 53.

LEE, No. 53.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By drawing back the cam-lever, the pressure of its cam-shaped lower surface on the bottom of the receiver, raises the rear end of the breech-bolt, and with it a lug on its under surface from out of a notch in the receiver, with which it has hitherto been engaged. This allows the bolt to be drawn backward, to an extent determined by the striking of a stop-screw through the side of the receiver, against the end of a corresponding groove in the breech-bolt. In cocking the cam-lever a projection on its inner surface engages with a notch in the upper section of the firing-pin and draws it back against the tension of the surrounding mainspring. When fully compressed the firing-pin is caught and held by the sear, the cam-lever itself being free to move.

Closed and locked.—By pushing forward the bolt until it meets the barrel it engages with the receiver as before described, and keeps the breech closed and locked against the discharge.

Fired.—By the action of the mainspring as above described.

Extraction.—By an extractor which plays in the under surface of the breech-bolt and engages with the rim of the cartridge by its forward hooked end projecting beyond the face of the bolt.

Ejection.—By the lower side of the rearmost arm of the extractor, striking against the end of the groove in the receiver in which it slides, when the piece is fully opened. This throws upward its forward end on which the empty shell is resting.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH SLIDES IN THE LINE OF THE BARREL BY DIRECT ACTION, *I. E.*, *BOLT-GUNS*, HAVING—

2.—OUTSIDE LOCKS.

VAN CHOATE.

JOSLYN-TOMES.

MERRILL, No. 83.

VAN CHOATE, No. 34.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By first cocking the piece, then raising the handle of the breech-bolt to a vertical position, and then withdrawing the bolt until it is arrested by striking against the upper end of the recoil-screw. In raising the handle, the beveled surface on the head of the firing-pin bears against the tip of the recoil-screw, and thus positively retracts the firing-pin.

Closed.—By reversing the motion of the bolt. The tip of the recoil-screw prevents the firing-pin from moving forward until the breech is fully closed.

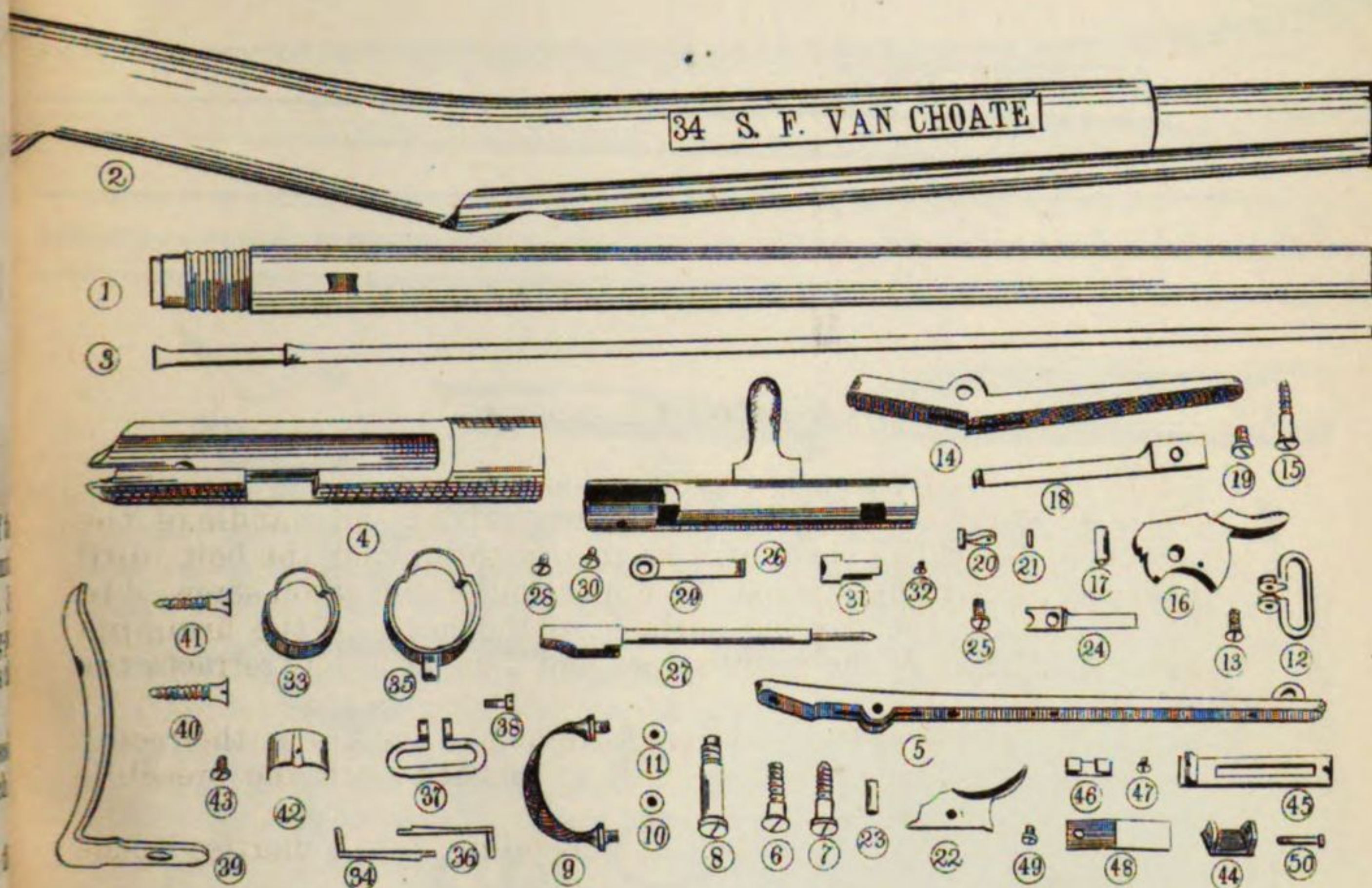
Locked.—By the base of the bolt-handle falling into a mortise in the side of the receiver.

Fired.—By a center-lock of the usual pattern.

Extraction.—By a spring-hook on the side of the bolt.

Ejection.—By a sliding ejector playing in a groove in the bottom of the bolt, and, in the act of withdrawing the bolt, struck forcibly against the tip of the recoil-screw. This throws the shell around the hook of the extractor by which it is held, and expels it completely from the gun.

NOTE.—The bolt cannot be moved unless the hammer is at the full-cock.



29 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

2 Stock.

TEN principal metallic parts
not otherwise mentioned:

- 4 Receiver,
- 16 Hammer,
- 26 Breech Bolt,
- 27 Firing Pin,
- 5 Guard Plate,
- 9 Guard Bow,
- 14 Tang,
- 22 Trigger,

- 20 Main Spring Swivel,
- 31 Ejector.

ELEVEN Screws:

- 28 Firing Pin Screw,
- 19 Main Spring Screw,
- 6 Guard Screw,
- 7 Guard Screw,
- 8 Recoil Screw,
- 10 Guard Bow Nut,
- 11 Guard Bow Nut,
- 15 Tang Screw,
- 25 Trigger Spring Screw,

- 30 Extractor Screw,
- 32 Ejector Screw.

THREE Pins:

- 17 Hammer Pin,
- 21 Main Spring Swivel Pin,
- 23 Trigger Pin.

THREE Springs:

- 18 Main Spring,
- 24 Trigger Spring,
- 29 Spring Extractor.

ONE other minor part:

- 2 Recoil Screw Bushing.

23 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 3 Ramrod,
- 12 Guard Plate Swivel,
- 13 Guard Plate Swivel Scr.,
- 39 Butt Plate,
- 40 Butt Plate Screw,
- 41 Butt Plate Screw,
- 42 Tip,

- 43 Tip Screw,
- 33 Upper Band,
- 34 Upper Band Spring,
- 35 Middle Band,
- 36 Middle Band Spring,
- 37 Middle Band Swivel,
- 38 Middle Band Swivel Scr.,
- 44 Rear Sight Base,

- 45 Rear Sight Leaf,
- 46 Rear Sight Leaf Slide,
- 47 Rear Sight Leaf Screw,
- 48 Rear Sight Spring,
- 49 Rear Sight Spring Screw,
- 50 Rear Sight Joint Screw.

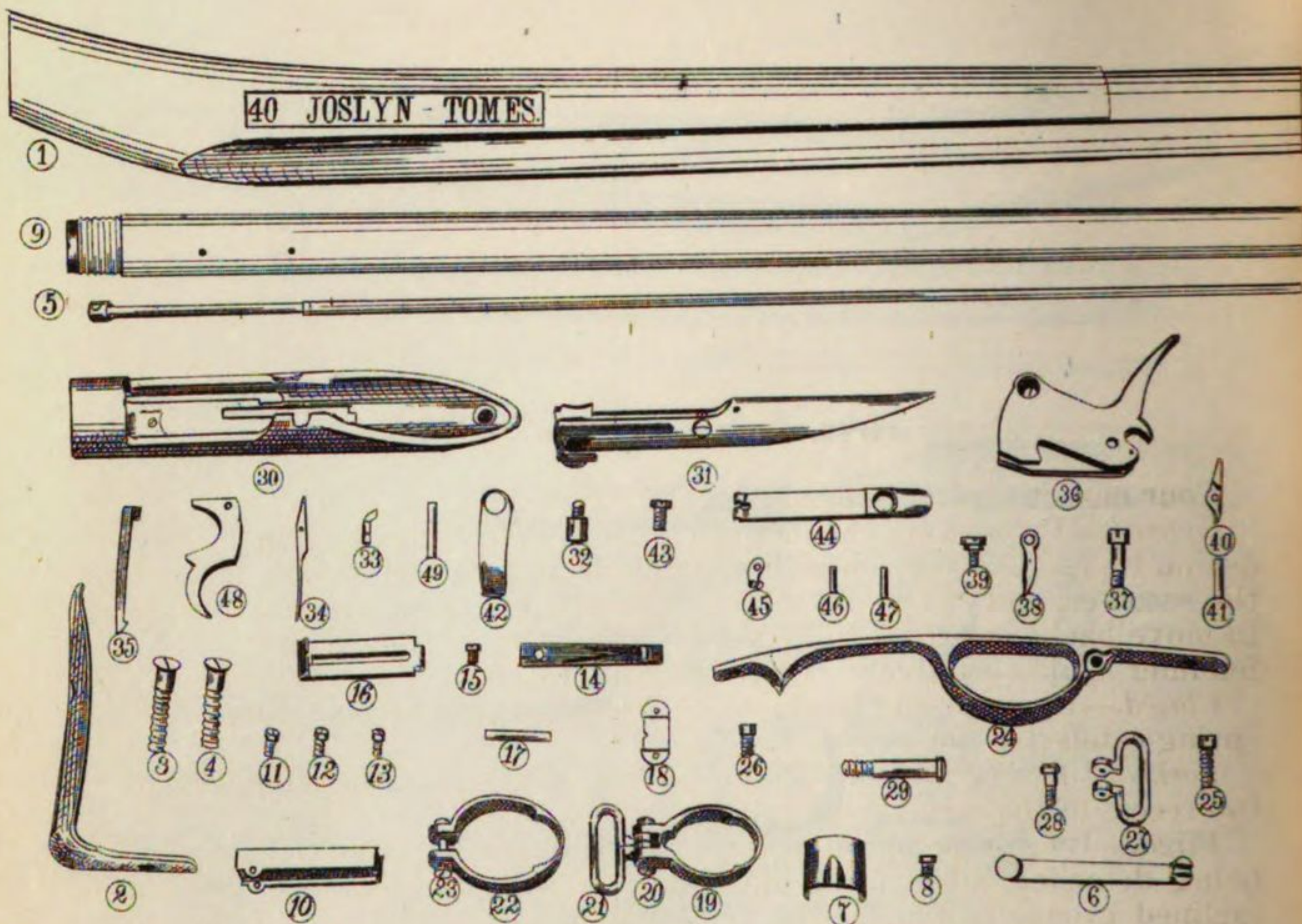
VAN CHOATE, No. 34.



15 PARTS NOT SPECIFIC TO THE SYSTEM, OR COMMON TO ALL ARMS.

1	Upper Band.	11	Leaf Right Hand Screw.	21	Hammer Pin.
2	Upper Band Screw.	12	Leaf Right Hand Screw.	22	Leaf Pin.
3	Upper Band Swivel.	13	Leaf Left Hand Screw.	23	Leaf Pin.
4	Lower Band.	14	Leaf Left Hand Spring.	24	Leaf Pin.
5	Lower Band Screw.	15	Leaf Left Hand Spring Screw.	25	Leaf Pin.
6	Lower Band Swivel.	16	Leaf Left Hand Spring.	26	Leaf Pin.
7	Guard Plate Swivel.	17	Leaf Left Hand Spring.	27	Leaf Pin.
8	Guard Plate Swivel Screw.	18	Leaf Left Hand Spring.	28	Leaf Pin.
9	Hammer Stop.	19	Leaf Left Hand Spring.	29	Leaf Pin.
10	Hammer Stop Screw.	20	Leaf Left Hand Spring.	30	Leaf Pin.

POCKET KNIFE, NO. 100



25 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:
1 Stock.

EIGHT principal metallic parts
not otherwise mentioned:

30 Receiver,
36 Hammer,
38 Firing Pin,
40 Sear,
24 Guard Plate,
31 Breech Bolt,
45 Main Spring Swivel,

48 Trigger.

SIX Screws:

39 Firing Pin Screw,
43 Sear Spring Screw,
25 Guard Plate Scr., Upper
26 Guard Plate Scr., Lower
32 Breech Bolt Stop Screw,
29 Tang Screw.

SIX Pins:

37 Hammer Pin,
41 Sear Pin,

33 Breech Bolt Friction Pin,
46 Main Spring Swivel Pin,
47 Main Spring Swivel Pin,
49 Trigger Pin.

FOUR Springs:

42 Sear Spring,
34 Breech Bolt Friction Pin
Spring,
44 Main Spring,
35 Spring Extractor.

25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Butt Plate,
3 Butt Plate Screw,
4 Butt Plate Screw,
5 Ramrod,
7 Tip,
8 Tip Screw,
9 Barrel and Front Sight,
10 Rear Sight Base,

11 Rear Sight Base Screw,
12 Rear Sight Base Screw,
13 Rear Sight Base Screw,
14 Rear Sight Spring,
15 Rear Sight Spring Screw,
16 Rear Sight Leaf,
17 Rear Sight Joint Pin,
18 Rear Sight Leaf Slide,

19 Upper Band,
20 Upper Band Screw,
21 Upper Band Swivel,
22 Lower Band,
23 Lower Band Screw,
27 Guard Plate Swivel,
28 Guard Plate Swivel Scr.,
6 Ramrod Stop.

JOSLYN-TOMES, No. 40.

JOSLYN-TOMES, No. 40.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By cocking the hammer. In so doing a hook-shaped shoulder on its forward portion is disengaged from a corresponding recess in the receiver, and the whole bolt, containing the hammer and lock, is free to move backward to its full extent. The firing-pin being linked to the hammer is also positively withdrawn from the face of the bolt.

Closed.—By reversing the motion of the bolt. It is held closed by a spring-catch (friction-pin) on its side.

Locked.—By the descent of the hooked portion of the hammer into the recess of the receiver when the piece is fired.

Fired.—By a back-action lock concealed in the bolt, the trigger alone being detached. The firing-pin descends with the hammer along an inclined groove in the face of the bolt leading to the site of the fulminate in the center of the cartridge-head.

Extraction.—By a spring-hook recessed in the side of the bolt, and riding over the rim of the cartridge when the piece is closed.

Ejection.—By the cartridge-shell being quickly withdrawn on two longitudinal guides, one on each side of the receiver, and ejected by the head striking first a stop on one guide, and then almost simultaneously a stop to the rear of the first on the other guide.

MERRILL, No. 83.

Four motions: Opened; loaded; closed; fired.

Opened.—By raising the handle of the breech-bolt to a vertical position and drawing it back to its full extent.

In raising the handle, the firing-pin is retracted by a lug near its head engaging with a spiral cam-recess in the receiver; it is held back by the lug entering a circumferential groove in the bolt. In withdrawing the bolt it passes over the hammer and presses it back to the full-cock.

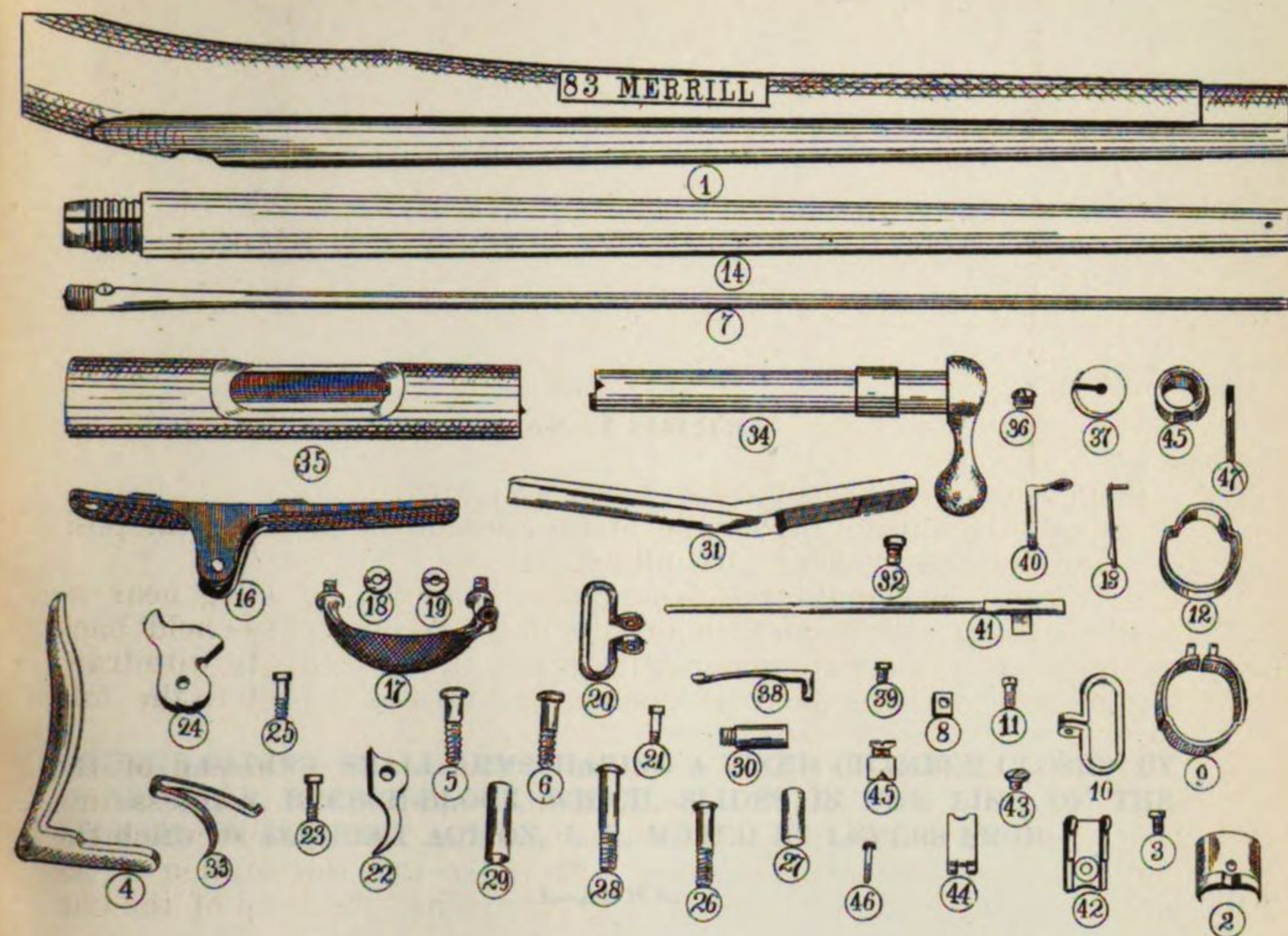
Closed.—By reversing the movement of the bolt. At the end of the forward stroke, the point of the extractor engages with a recess in a ring which surrounds the mouth of the chamber, and against which the bolt is pressed, and turns the ring with it; so that the rotation of the bolt in locking will not cause it to grind against the head of the cartridge.

Locked.—In turning down the handle the piece is locked by the engaging of a sectional collar on the bolt with a corresponding groove in the receiver. When this is accomplished the lug on the firing-pin is opposite the deepest part of the spiral recess and is free to move forward when the piece is fired.

Fired.—By a center-lock moved by a double mainspring.

Extraction.—By a spring-hook lying on top of the breech-bolt.

Ejection.—In drawing back the bolt, the natural spring of the extractor presses down the rim of the cartridge upon the bottom of the receiver, until it is checked by striking against a notch left there for that purpose, and is thereby thrown upward around the hook of the extractor and clear of the gun.



27 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

TEN principal metallic parts
not otherwise mentioned:

- 15 Chamber Ring,
- 16 Guard Plate,
- 17 Guard Bow,
- 22 Trigger,
- 24 Hammer,
- 31 Tang,
- 34 Breech Bolt,
- 35 Receiver,

37 Firing Pin Stop,

41 Firing Pin.

ELEVEN Screws:

- 18 Guard Bow Nut,
- 19 Guard Bow Nut,
- 23 Trigger Screw,
- 25 Hammer Screw,
- 26 Guard Screw, Upper
- 28 Guard Screw, Lower
- 30 Recoil Screw,
- 32 Tang Screw,
- 36 Breech Bolt Stop Screw,

39 Spring Extractor Screw,

40 Breech Bolt Locking Scr.

THREE Springs:

- 33 Main Spring,
- 38 Spring Extractor,
- 47 Barrel Chamber Ring Spr.

Two other minor parts:

- 27 Upper Guard Scr'w Thimble,
- 29 Lower Guard Scr'w Thimble.

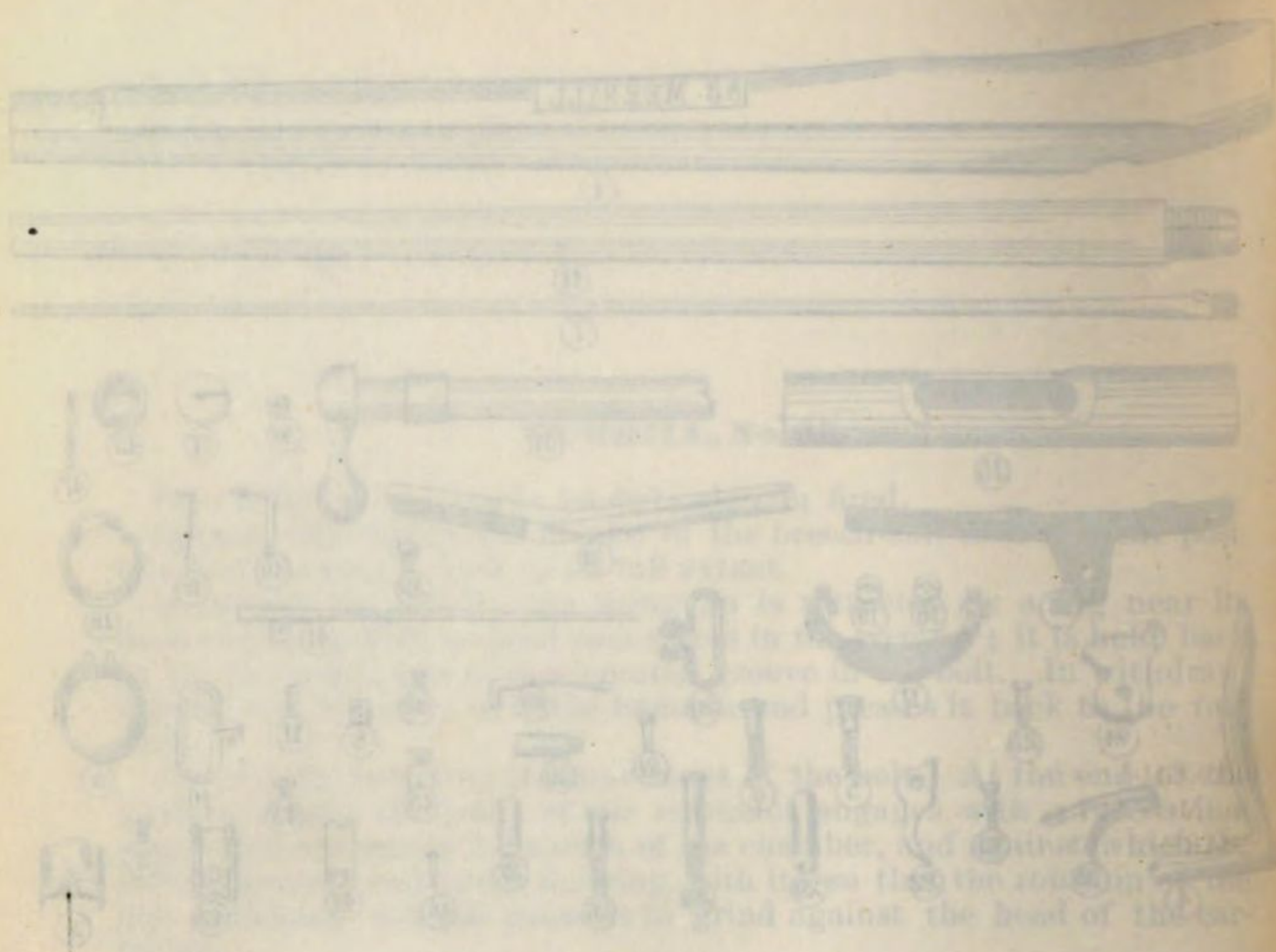
21 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 2 Tip,
- 3 Tip Screw,
- 4 Butt Plate,
- 5 Butt Plate Screw,
- 6 Butt Plate Screw,
- 7 Ramrod,
- 8 Ramrod Stop,

- 9 Lower Band,
- 10 Lower Band Swivel,
- 11 Lower Band Screw,
- 12 Upper Band,
- 13 Upper Band Spring,
- 14 Barrel and Front Sight,
- 20 Guard Bow Swivel,

- 21 Guard Bow Swivel Scr.,
- 42 Rear Sight Base,
- 43 Rear Sight Base Screw,
- 44 Rear Sight Long Leaf,
- 45 Rear Sight Short Leaf,
- 46 Rear Sight Joint Screw.

MERRILL, No. 83.



These parts are required for the construction of the machine. The parts are shown in the accompanying drawings. The parts are as follows:

PARTS REQUIRED FOR THE MACHINE		PARTS REQUIRED FOR THE MACHINE	
1. Upper frame	1. Upper frame	1. Upper frame	1. Upper frame
2. Lower frame	2. Lower frame	2. Lower frame	2. Lower frame
3. Upper frame	3. Upper frame	3. Upper frame	3. Upper frame
4. Lower frame	4. Lower frame	4. Lower frame	4. Lower frame
5. Upper frame	5. Upper frame	5. Upper frame	5. Upper frame
6. Lower frame	6. Lower frame	6. Lower frame	6. Lower frame
7. Upper frame	7. Upper frame	7. Upper frame	7. Upper frame
8. Lower frame	8. Lower frame	8. Lower frame	8. Lower frame
9. Upper frame	9. Upper frame	9. Upper frame	9. Upper frame
10. Lower frame	10. Lower frame	10. Lower frame	10. Lower frame
11. Upper frame	11. Upper frame	11. Upper frame	11. Upper frame
12. Lower frame	12. Lower frame	12. Lower frame	12. Lower frame
13. Upper frame	13. Upper frame	13. Upper frame	13. Upper frame
14. Lower frame	14. Lower frame	14. Lower frame	14. Lower frame
15. Upper frame	15. Upper frame	15. Upper frame	15. Upper frame
16. Lower frame	16. Lower frame	16. Lower frame	16. Lower frame
17. Upper frame	17. Upper frame	17. Upper frame	17. Upper frame
18. Lower frame	18. Lower frame	18. Lower frame	18. Lower frame
19. Upper frame	19. Upper frame	19. Upper frame	19. Upper frame
20. Lower frame	20. Lower frame	20. Lower frame	20. Lower frame

MINUTIA, No. 10

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK WHICH, SLIDES IN THE LINE OF THE BARREL BY INDIRECT ACTION, *I. E.*, MOVED BY LEVERS FROM—

1.—ABOVE.

BARNEKOV-GREENE.

BARNEKOV-GREENE.

This arm was withdrawn without being photographed or examined with sufficient closeness for an accurate description of its working. There was a short sliding block, back of which was a pair of links, secured at their forward end to the block, and in rear to the frame. The rearmost one of them contained the hammer, in cocking which the combination was bent upward, and so withdrew the block.

The cartridge-shells when extracted dropped through a hole left for the purpose in the frame.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH SLIDES IN THE LINE OF THE BARREL BY INDIRECT ACTION, *I. E.*, MOVED BY LEVERS FROM—

2.—BELOW.

WINCHESTER.

STETSON.

BURGESS.

ALFRED BEALS, No. 49.

RUMSEY.

WINCHESTER MAGAZINE-ARM, No. 78.

Three motions as a repeater; four motions as a single-loader, viz: Opened; closed; fired—or opened; loaded; closed; fired.

Opened.—By the first motion of depressing the lever its upper arm draws back the breech-bolt by means of a pair of links, one end of which is connected with the bolt and the other end with the receiver.

In an interior groove in the rearmost of the links a transverse pin on the lever arm plays back and forth, closing and extending the pair as the breech is opened and closed. As the bolt is drawn backward it presses against the face of the hammer and brings it to the full-cock. A lever hung on the same pin as the forward link engages meanwhile with a notch in the firing-pin and positively retracts it from the face of the bolt.

As the motion of the lever is continued, a projection on its front surface strikes the under side of the carrier-lever near their common center of motion, and raises it with the carrier at its remote forward end, until the cartridge which the latter contains is exactly opposite the chamber of the piece. A friction-spring bearing upon the hub of the carrier-lever then falls into a notch, and holds it in position after the support of the lever has been withdrawn.

Closed.—By the first part of the motion of returning the lever to its former position, the transverse pin in its upper arm extends the pair of links, carrying the bolt forward against the cartridge and pressing it into the chamber. As the closing of the lever is continued, the striking of its upper arm upon the carrier-lever, throws down the carrier opposite the magazine, where it is supplied with a fresh cartridge by the action of the magazine-spring.

Locked.—By the support afforded the bolt by the links, the middle joint of which, when they are extended, is in line with the points of reception and transmittal of the strain.

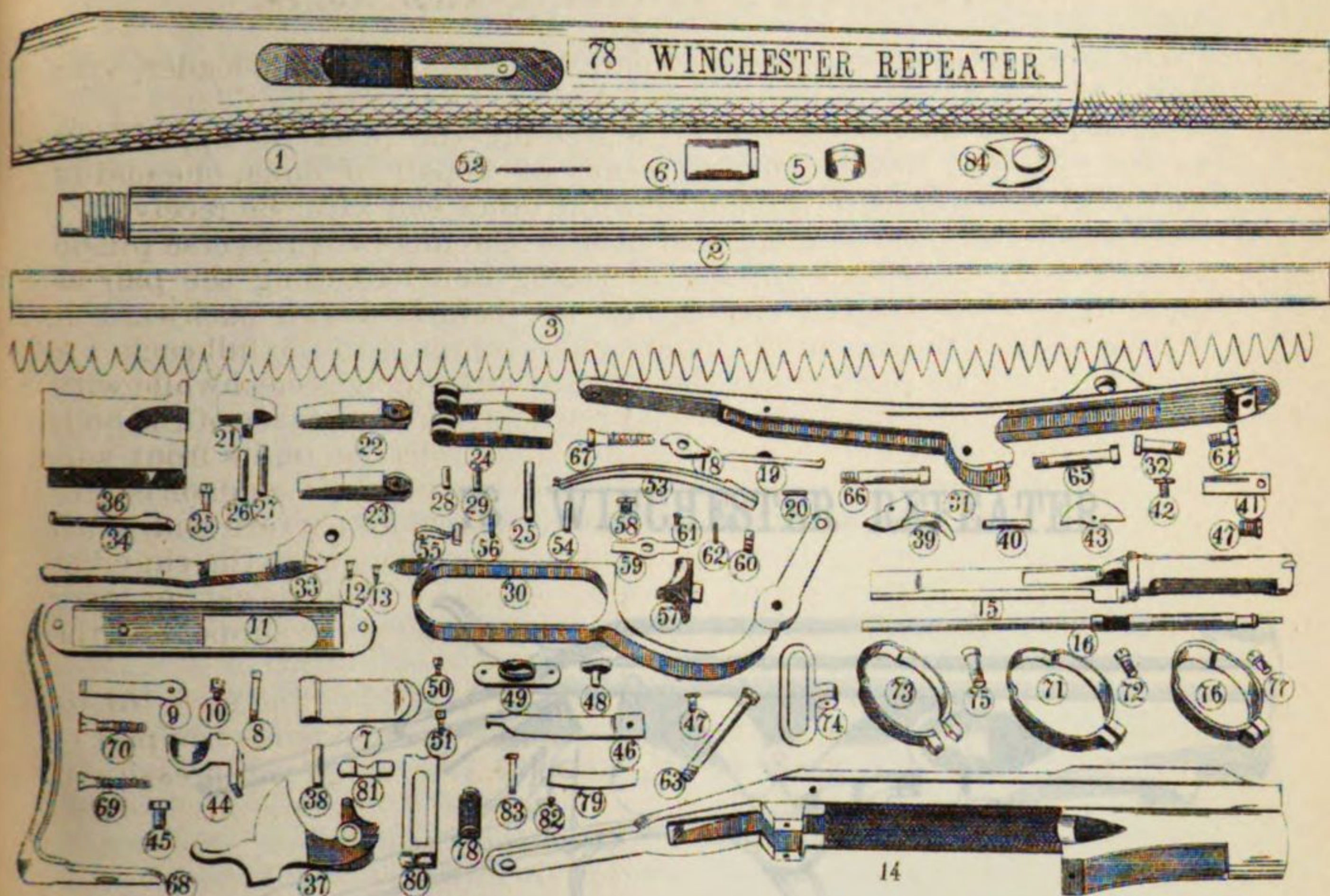
Fired.—By a center-lock of the usual pattern, the firing-pin passing completely through the bolt.

A secondary or safety sear, to prevent the firing of the piece before the breech is closed, blocks the trigger, by passing behind it through the guard-strap, while the lever is down. As the lever is closed, a projection on its upper surface pushes the safety sear out of the way of the backward movement of the trigger, and allows the piece to be fired.

Extraction.—By a spring-hook on top of the bolt, riding over the rim of the cartridge as the piece is closed, and nipping the cartridge-head between it and a notched-stud on the under side of the face of the bolt.

Ejection.—By the rising of the carrier as the empty shell is withdrawing, it strikes it from below, turns it around the extractor, by which it is held, and throws it clear of the gun.

The magazine is charged through a hole in the side of the stock, covered by a swinging lid and communicating with the mouth of the tube through the trough of the carrier. Through this opening into the carrier, the cartridge is also passed when the piece is used as a single-loader; the magazine, if charged, being cut off and held in reserve by a stop which is brought within the limits of the magazine by the passage of the inclined plane into which its lower surface is formed over a transverse pin below it. The stop is moved and kept in place by an external thumb-piece.



68 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

TWENTY-FIVE principal metallic parts not otherwise mentioned:

- 3 Magazine,
- 5 Magazine Spring Stop,
- 6 Magazine Follower,
- 7 Loading Lid,
- 11 Loading Lid Plate,
- 14 Receiver,
- 15 Breech Bolt,
- 16 Firing Pin,
- 18 Firing Pin Retractor,
- 21 B. Bolt Link Hinge Piece,
- 22 Breech Bolt Link,
- 23 Breech Bolt Link,
- 24 Breech Bolt Link,
- 30 Lever,
- 31 Lever Plate,
- 33 Carrier Lever,
- 36 Carrier,
- 37 Hammer,
- 39 Trigger,
- 43 Safety Sear,
- 48 Magazine Cut-off Thumb Piece,

- 49 Magazine Cut-off Plate,
- 55 Main Spring Swivel,
- 57 Lever Catch,
- 84 Magazine Cap.

SEVENTEEN Screws:

- 10 Loading Lid Spring Scr.,
- 12 Loading Lid Plate Screw,
- 13 Loading Lid Plate Screw,
- 17 Firing Pin Stop Screw,
- 32 Guard Screw,
- 35 Carrier Lever Spring Scr.,
- 42 Trigger Spring Screw,
- 45 Charging Guide Screw,
- 47 Magazine Cut-off Screw,
- 50 Magazine Cut-off Plate Screw,
- 51 Magazine Cut-off Plate Screw,
- 58 Lever Catch Screw,
- 63 Tang Screw,
- 64 Lever Plate Screw, Upper
- 65 Lever Plate Screw, Middle
- 66 Lever Plate Screw, Middle
- 67 Lever Plate Screw, Lower

FOURTEEN Pins:

- 8 Loading Lid Pin,
- 20 Spring Extractor Pin,

- 25 Breech Bolt Link Hinge Piece Pin,
- 26 Breech Bolt Link Pin,
- 27 Breech Bolt Link Pin,
- 28 Breech Bolt Link Pin,
- 29 Breech Bolt Link Pin,
- 38 Hammer Pin,
- 40 Trigger Pin,
- 52 Magazine Cut-off Guide Pin,
- 54 Main Spring Pin,
- 56 Main Spring Swivel Pin,
- 60 Lever Catch Pin,
- 62 Lever Catch Pin Stop Pin.

NINE Springs:

- 4 Magazine Spring,
- 9 Magazine Cover Pin Spr.,
- 19 Spring Extractor,
- 34 Carrier Lever Spring,
- 41 Trigger Spring,
- 46 Magazine Cut-off Spring,
- 53 Main Spring,
- 59 Lever Catch Spring,
- 61 Lever Catch Pin Spring.

Two other minor parts:

- 44 Charging Guide,
- 44 Charg. Guide Dowel Pin.

18 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

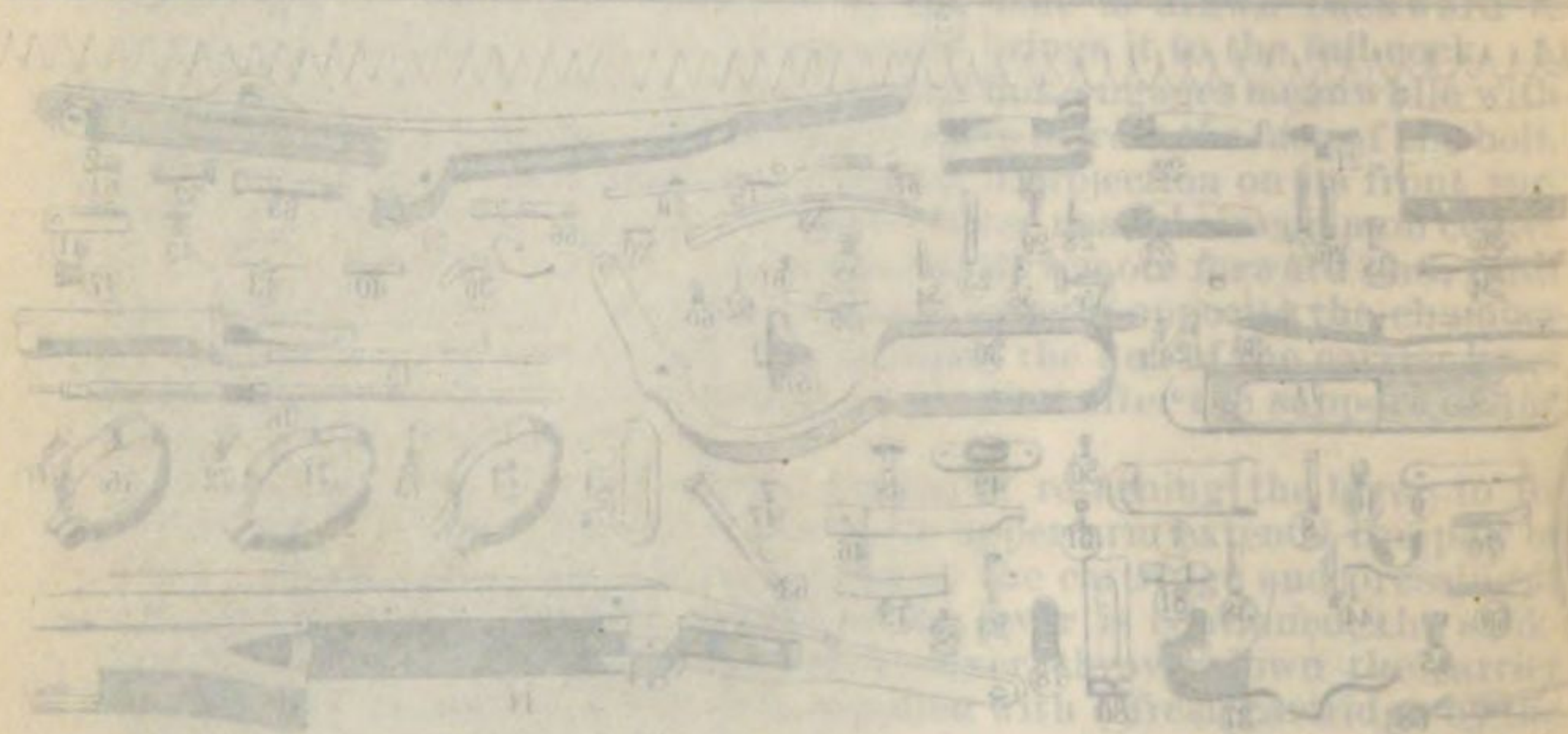
- 2 Barrel and Front Sight,
- 68 Butt Plate,
- 69 Butt Plate Screw,
- 70 Butt Plate Screw,
- 71 Lower Band,
- 72 Lower Band Screw,

- 73 Middle Band,
- 74 Middle Band Swivel,
- 75 Middle Band Screw,
- 76 Upper Band,
- 77 Upper Band Screw,
- 78 Rear Sight Base,

- 79 Rear Sight Spring,
- 80 Rear Sight Leaf,
- 81 Rear Sight Leaf Slide,
- 82 Rear Sight Leaf Screw,
- 83 Rear Sight Joint Screw.

WINCHESTER, No. 78.

WINDMILL REEFER



18 PARTS NOT PECULIAR TO THE SYSTEM OR COMMON TO ALL AREAS

- 1. Main shaft
- 2. Main gear
- 3. Main pinion
- 4. Main frame
- 5. Main support
- 6. Main base
- 7. Main housing
- 8. Main cover
- 9. Main door
- 10. Main lock
- 11. Main handle
- 12. Main lever
- 13. Main spring
- 14. Main bolt
- 15. Main nut
- 16. Main washer
- 17. Main pin
- 18. Main screw
- 19. Main rivet
- 20. Main nail
- 21. Main cord
- 22. Main rope
- 23. Main cable
- 24. Main wire
- 25. Main thread
- 26. Main plug
- 27. Main cap
- 28. Main gasket
- 29. Main seal
- 30. Main ring
- 31. Main band
- 32. Main strap
- 33. Main belt
- 34. Main pulley
- 35. Main roller
- 36. Main guide
- 37. Main stop
- 38. Main limit
- 39. Main switch
- 40. Main button

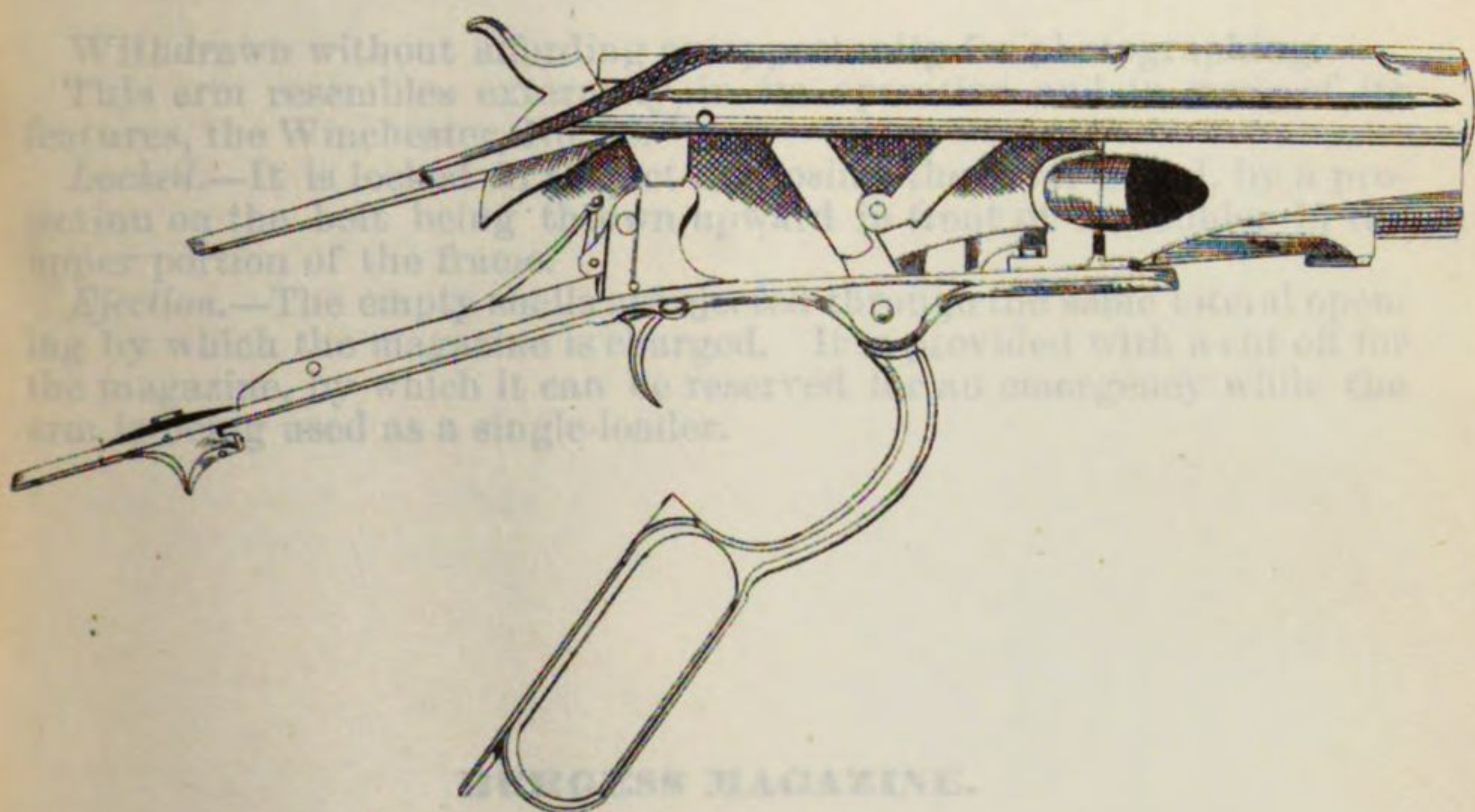
- 1. Main shaft
- 2. Main gear
- 3. Main pinion
- 4. Main frame
- 5. Main support
- 6. Main base
- 7. Main housing
- 8. Main cover
- 9. Main door
- 10. Main lock
- 11. Main handle
- 12. Main lever
- 13. Main spring
- 14. Main bolt
- 15. Main nut
- 16. Main washer
- 17. Main pin
- 18. Main screw
- 19. Main rivet
- 20. Main nail
- 21. Main cord
- 22. Main rope
- 23. Main cable
- 24. Main wire
- 25. Main thread
- 26. Main plug
- 27. Main cap
- 28. Main gasket
- 29. Main seal
- 30. Main ring
- 31. Main band
- 32. Main strap
- 33. Main belt
- 34. Main pulley
- 35. Main roller
- 36. Main guide
- 37. Main stop
- 38. Main limit
- 39. Main switch
- 40. Main button

- 1. Main shaft
- 2. Main gear
- 3. Main pinion
- 4. Main frame
- 5. Main support
- 6. Main base
- 7. Main housing
- 8. Main cover
- 9. Main door
- 10. Main lock
- 11. Main handle
- 12. Main lever
- 13. Main spring
- 14. Main bolt
- 15. Main nut
- 16. Main washer
- 17. Main pin
- 18. Main screw
- 19. Main rivet
- 20. Main nail
- 21. Main cord
- 22. Main rope
- 23. Main cable
- 24. Main wire
- 25. Main thread
- 26. Main plug
- 27. Main cap
- 28. Main gasket
- 29. Main seal
- 30. Main ring
- 31. Main band
- 32. Main strap
- 33. Main belt
- 34. Main pulley
- 35. Main roller
- 36. Main guide
- 37. Main stop
- 38. Main limit
- 39. Main switch
- 40. Main button

As a single loader.—In this case, with the exception of the breech, which is done through the side before the piece is opened, or through the top of the receiver when the bolt is drawn back, the motions are the same as when using the magazine.

The ammunition used in this arm was ignited by the Milsark primer, in which the fulminate is contained in a small tube passed through the head of the cartridge and having its outer end conically recessed, so as to protect the fulminate from accidental ignition in the magazine by impact from the cartridge lying next below it. When fired, the point of the firing pin enters this cavity and wedges the fulminate around it against the external walls of the primer, in this way causing the explosion.

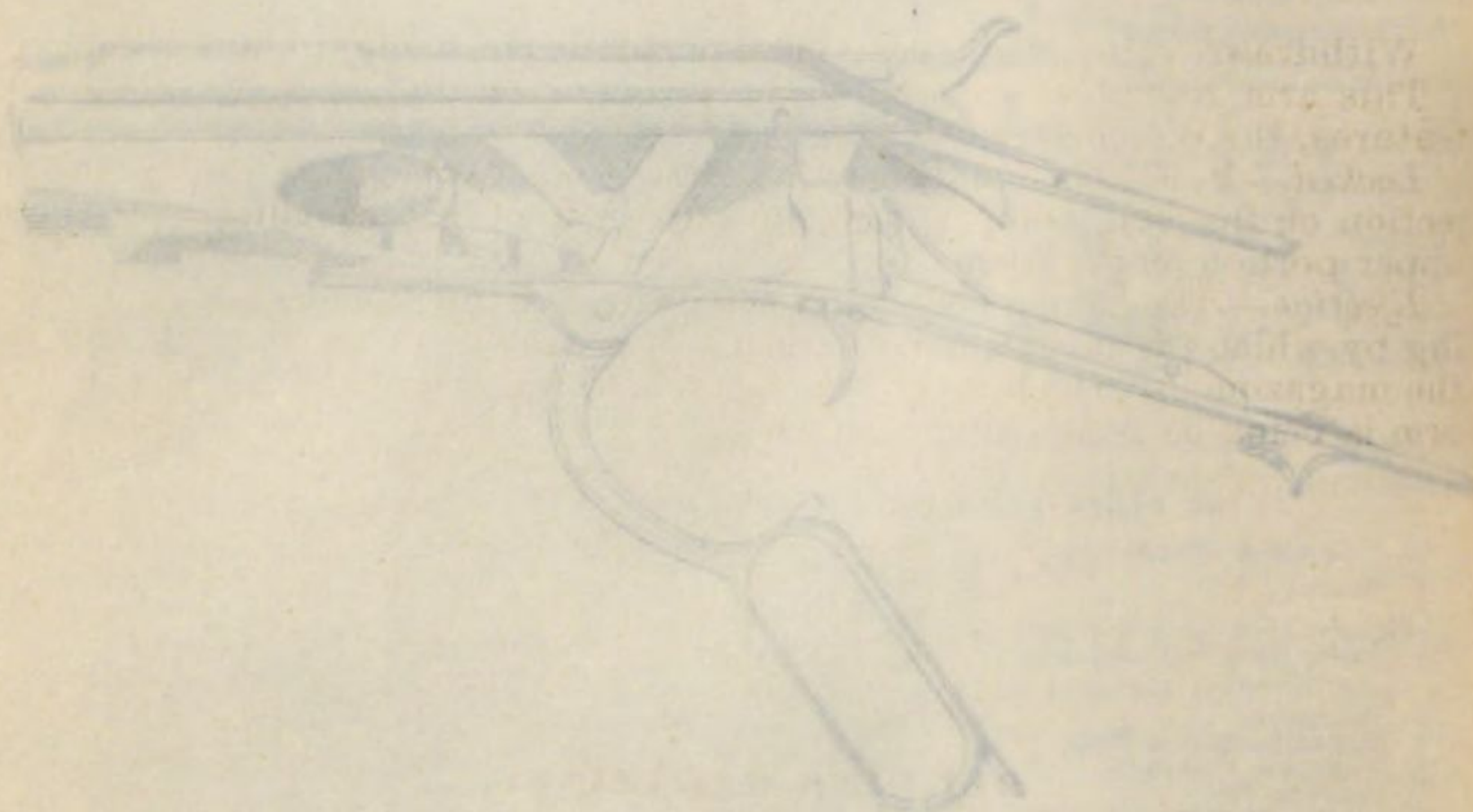
78 WINCHESTER REPEATER.



This arm was merely exhibited to the Board, not even being fired in their presence and no photograph was taken. A short breech-block slides to and from the end of the barrel by means of a solid lever, the forward upper corner of the body of which is pivoted to the back of the block. When the piece is closed, the body of the lever stands against the back of the slot in the frame in which the block moves. The lower portion is drawn out into a tang of the usual form, which, besides serving as a trigger-guard, is so shaped in front that it opposes the piece it forms a constant fulcrum against the front of the slot in which it moves in the lower side of the frame. By means of this support and of its connection with the breech-block, it can thus withdraw it, acting a central hammer as it moves. A magazine is carried beneath the barrel, from which the cartridges are fed into a carrier of the usual form.

The extracting and ejecting apparatus are like those usually found in bolt-guns.

78 WINCHESTER REPEATER



As a single-loader.—In this case, with the exception of the loading, which is done through the side before the piece is opened, or through the top of the receiver when the bolt is drawn back, the motions are the same as when using the magazine.

The ammunition used in this arm was ignited by the Milbank primer, in which the fulminate is contained in a small tube passed through the head of the cartridge and having its outer end conically recessed, so as to protect the fulminate from accidental ignition in the magazine by impact from the cartridge lying next below it. When fired, the point of the firing pin enters this cavity and wedges the fulminate around it against the external walls of the primer, in this way causing the explosion.

STETSON MAGAZINE, NO. 52.

Withdrawn without affording an opportunity for photographing.

This arm resembles externally, in its operation and in many of its features, the Winchester, No. 78.

Locked.—It is locked in the act of closing the lever-guard, by a projection on the bolt being thrown upward in front of a shoulder in the upper portion of the frame.

Ejection.—The empty shells are ejected through the same lateral opening by which the magazine is charged. It is provided with a cut-off for the magazine, by which it can be reserved for an emergency while the arm is being used as a single-loader.

BURGESS MAGAZINE.

This arm was merely exhibited to the Board, not even being fired in their presence and no photograph was taken. A short breech-block slides to and from the end of the barrel by means of a solid lever, the forward upper corner of the body of which, is jointed to the back of the block. When the piece is closed, the body of the lever abuts against the back of the slot in the frame in which the block moves. Its lower portion is drawn out into a tang of the usual form, which, besides serving as a trigger-guard, is so shaped in front that in opening the piece it forms a constant fulcrum against the front of the slot in which it moves in the lower side of the frame. By means of this support and of its connection with the breech-block, it can thus withdraw it, cocking a central hammer as it moves. A magazine is carried beneath the barrel, from which the cartridges are fed into a carrier of the usual form.

The extracting and ejecting apparatus are like those usually found in bolt-guns.

A. C. BEALS, No. 49.

Wooden Model.

Five motions, viz: Opened; loaded; full-cocked; fired.

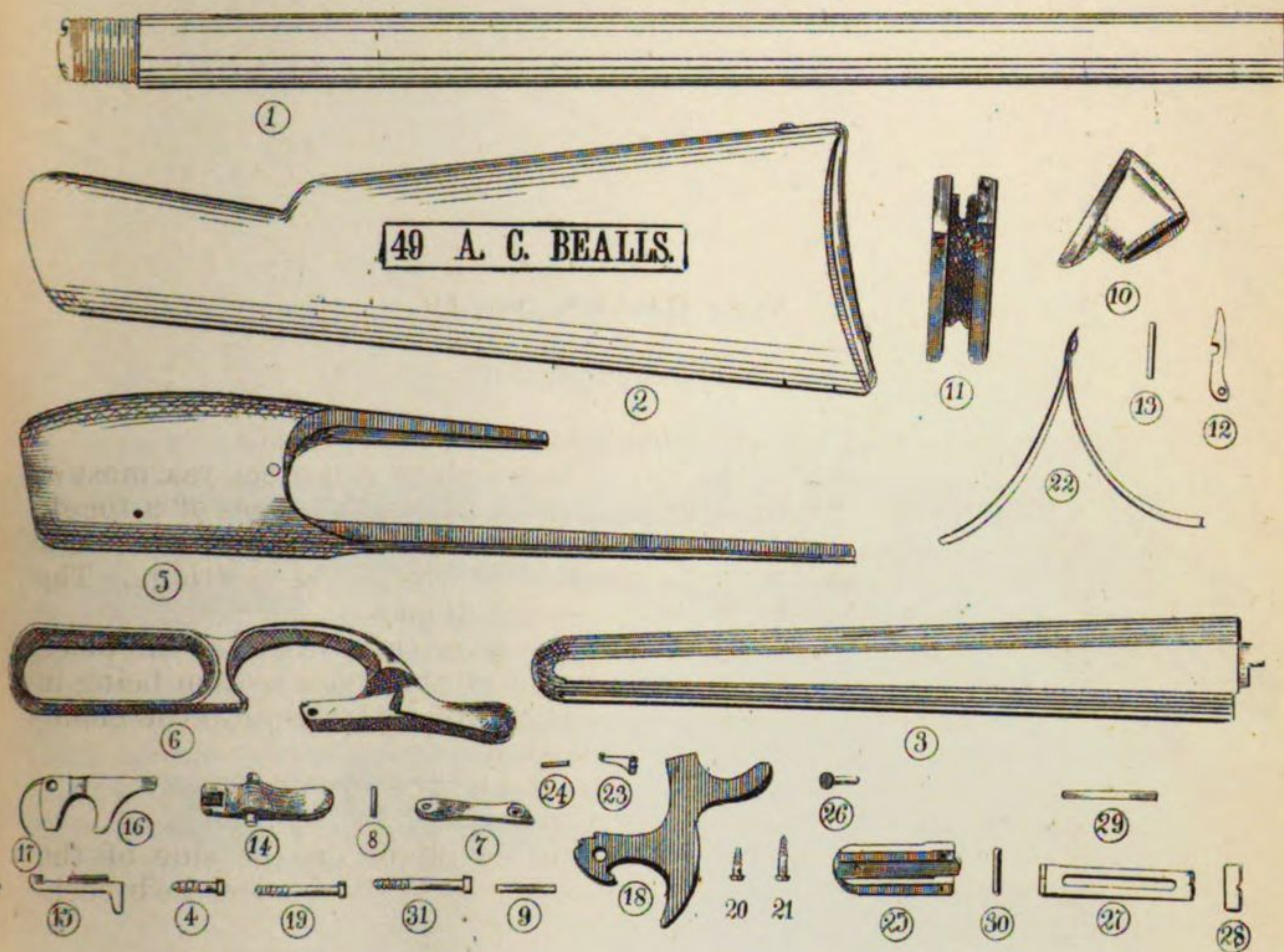
Opened.—By depressing the lever; this brings down the rearmost of two folding-wedges which form the breech-block, by means of a toggle or link, and at the same time withdraws the upper section of the block to its full extent and then drops it out of the way of the cartridge. The hammer is simultaneously brought to the half-cock.

Closed.—By reversing the action of the lever the sections of the block are brought into place, the last movement of the upper section being in the line of the barrel, thus tending to press the cartridge into the chamber if it be not already completely inserted.

Locked.—By the position of the breech-block.

Fired.—By a tang-lock of the usual pattern.

Extraction and Ejection.—By a sliding extractor on the side of the barrel, impelled backward by a spring, when by the descent of the breech-block the way for it is clear.



23 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Butt Stock,
- 3 Tip Stock.

ELEVEN principal metallic parts not otherwise mentioned:

- 5 Frame,
- 6 Lever,
- 7 Link,
- 10 Breech Block, Front Section,
- 11 Breech Block, Rear Section,
- 12 Firing Pin,
- 14 Trigger,
- 15 Extractor,
- 16 Ejector,
- 18 Hammer,
- 23 Main Spring Swivel.

THREE Screws:

- 19 Hammer Screw,
- 20 Tang Screw,
- 21 Tang Screw.

FIVE Pins:

- 8 Link Pin,
- 9 Link Pin,
- 13 Firing Pin Stop Pin,
- 14 Trigger Pin,
- 24 Main Spring Swivel Pin.

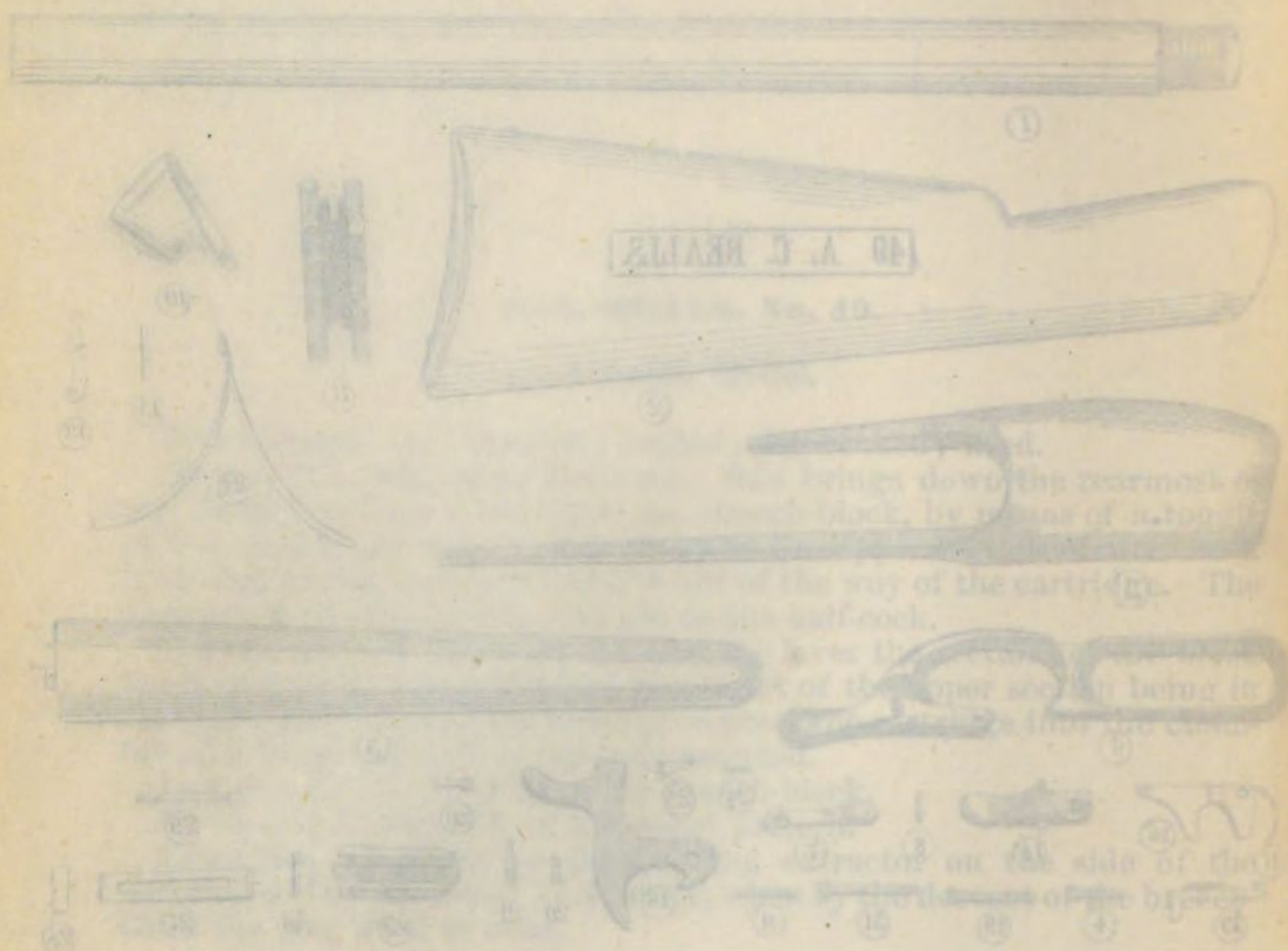
Two Springs:

- 17 Ejector Spring,
- 22 Main Spring.

12 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 2 Butt Plate,
- 2 Butt Plate Screw,
- 2 Butt Plate Screw,
- 4 Tip Stock Screw,
- 25 Rear Sight Base,
- 26 Rear Sight Base Pin,
- 27 Rear Sight Leaf,
- 28 Rear Sight Leaf Slide,
- 29 Rear Sight Spring,
- 30 Rear Sight Joint Pin.

A. C. BEALLS, No. 49.



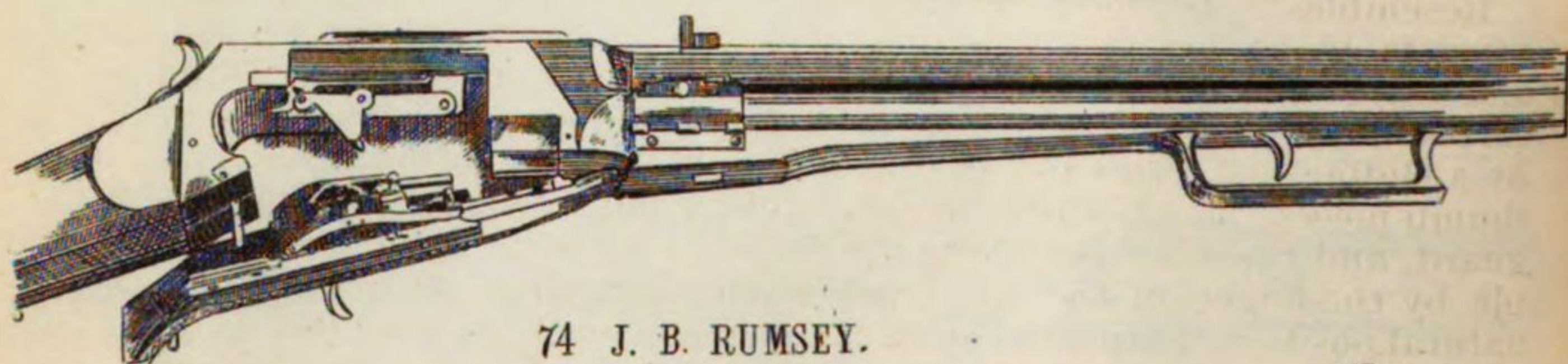
22 PARTS ESSENTIAL AND ESSENTIAL TO THE SYSTEM.

1	Two of Wood:	11	Hammer Head, Iron 200-	21	Iron Spring
2	Hammer Head	12	Hammer Head, Iron 200-	22	Iron Spring
3	Two of Wood:	13	Hammer Head, Iron 200-	23	Iron Spring
4	Hammer Head	14	Hammer Head, Iron 200-	24	Iron Spring
5	Hammer Head	15	Hammer Head, Iron 200-	25	Iron Spring
6	Hammer Head	16	Hammer Head, Iron 200-	26	Iron Spring
7	Hammer Head	17	Hammer Head, Iron 200-	27	Iron Spring
8	Hammer Head	18	Hammer Head, Iron 200-	28	Iron Spring
9	Hammer Head	19	Hammer Head, Iron 200-	29	Iron Spring
10	Hammer Head	20	Hammer Head, Iron 200-	30	Iron Spring

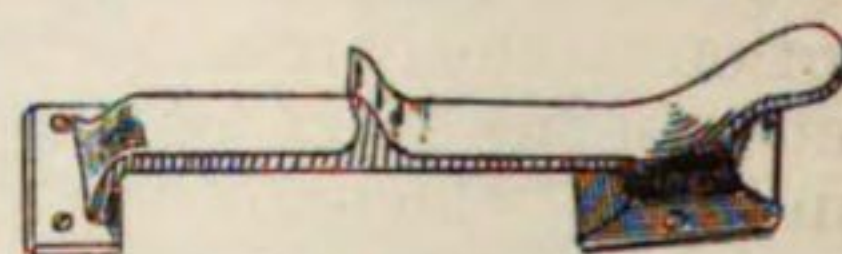
23 PARTS NOT ESSENTIAL TO THE SYSTEM, OR COMMON TO ALL ARMS.

1	Hammer Head	11	Hammer Head	21	Iron Spring
2	Hammer Head	12	Hammer Head	22	Iron Spring
3	Hammer Head	13	Hammer Head	23	Iron Spring
4	Hammer Head	14	Hammer Head	24	Iron Spring
5	Hammer Head	15	Hammer Head	25	Iron Spring
6	Hammer Head	16	Hammer Head	26	Iron Spring
7	Hammer Head	17	Hammer Head	27	Iron Spring
8	Hammer Head	18	Hammer Head	28	Iron Spring
9	Hammer Head	19	Hammer Head	29	Iron Spring
10	Hammer Head	20	Hammer Head	30	Iron Spring

A. C. HEALD, No. 40



74 J. B. RUMSEY.



RUMSEY, No. 74.

Wooden model.

Resembles in its general features the Winchester arm. Its peculiarity consists in having two magazine-tubes, one on each side of the barrel and beneath it. From these the cartridges are fed alternately into the corresponding carriers, which are moved up and down by levers operated by a sliding-rod. This rod is drawn to and from the operator by two thumb-pieces, one of which, for the right hand, is within the trigger-guard, and the other lies along the barrel in a position readily accessible by the fingers of the left hand when supporting the piece in the natural position of firing. The mechanism for communicating this reciprocal motion to the carrier-levers, consists mainly of an oscillating lever lying between the other two, and its connections in the form of springs, stops, and pins, which are designed for directing the stroke on each of its sides alternately.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK WHICH SLIDES AT 90° TO THE BARREL AND—

1.—VERTICALLY.

SHARPS.

20 ORD

SHARPS, No. 5.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—By depressing the lever it draws down the breech-block from its position in rear of the barrel; the firing-pin as it moves, being retracted by a shoulder on its side passing through an inclined groove in the frame.

Closed.—By reversing the above.

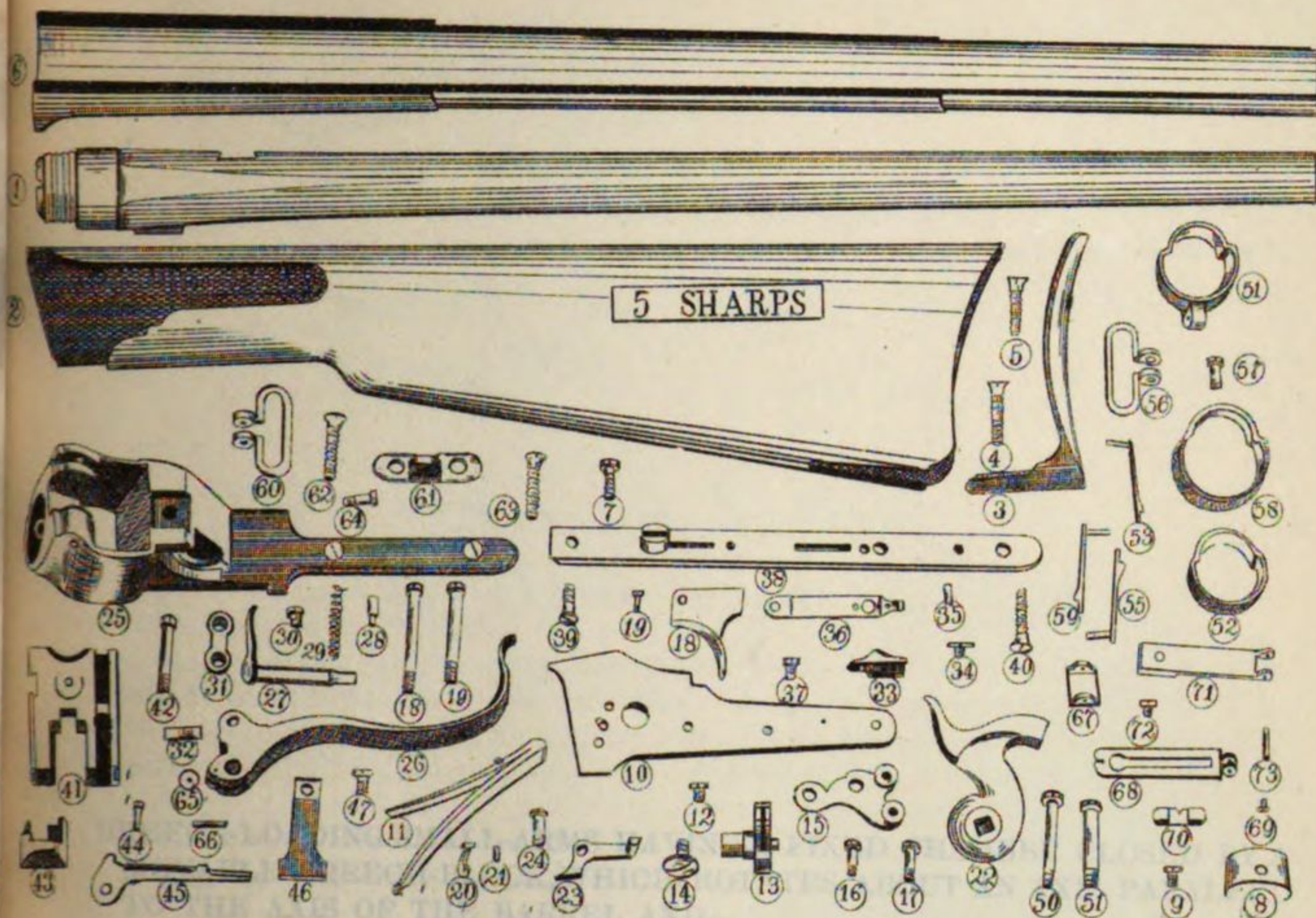
Locked.—By the position of the breech-block, which is held in place by the lever under the action of the lever-spring.

Fired.—By a back-action side lock of the usual pattern.

Extraction.—By a bent lever pivoted below the chamber and struck by the downward movement of the breech-block in opening.

Ejection.—By accelerating the above by the action of the lever-spring, transmitted through the cam-like head of the lever to the block, and by it to the extractor.

NOTE.—This is the arm issued for experimental trial in the field.



49 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Butt Stock,
- 6 Tip Stock.

FIFTEEN principal metallic parts not otherwise mentioned:

- 10 Lock Plate,
- 13 Tumbler,
- 15 Bridle,
- 18 Trigger,
- 20 Main Spring Swivel,
- 22 Hammer,
- 23 Sear,
- 25 Frame,
- 28 Lever,
- 31 Link,
- 33 Lever Catch,
- 34 Guard Strap,
- 41 Breech Block,
- 43 Firing Pin,

- 45 Extractor.

TWENTY-ONE Screws and Nuts:

- 7 Recoil Stud Screw,
- 12 Main Spring Screw,
- 14 Tumbler Screw,
- 16 Bridge Screw,
- 17 Bridge Screw,
- 19 Trigger Screw,
- 21 Main Spring Swivel Scr.,
- 24 Sear Screw,
- 30 Hinge Pin Stop Screw,
- 32 Lever Link Screw,
- 34 Lever Catch Screw,
- 37 Lever Catch Spring Scr.,
- 39 Guard Strap Screw, Front
- 40 Guard Strap Screw, Rear
- 42 Breech Block Link Screw,
- 44 Firing Pin Screw,
- 47 Lever Spring Screw,

- 48 Side Screw, Front
- 49 Side Screw, Rear
- 50 Tang Screw, Front
- 51 Tang Screw, Rear

THREE Pins:

- 27 Hinge Pin,
- 35 Lever Catch Spring Pin,
- 66 Lever Friction Roll Pin.

FOUR Springs:

- 11 Main Spring,
- 29 Hinge Pin Stop Spring,
- 36 Lever Catch Spring,
- 46 Lever Spring.

FOUR other minor parts:

- 2 Side Screw Washer,
- 6 Recoil Stud Screw Washer,
- 28 Hinge Pin Stop,
- 65 Lever Friction Roll.

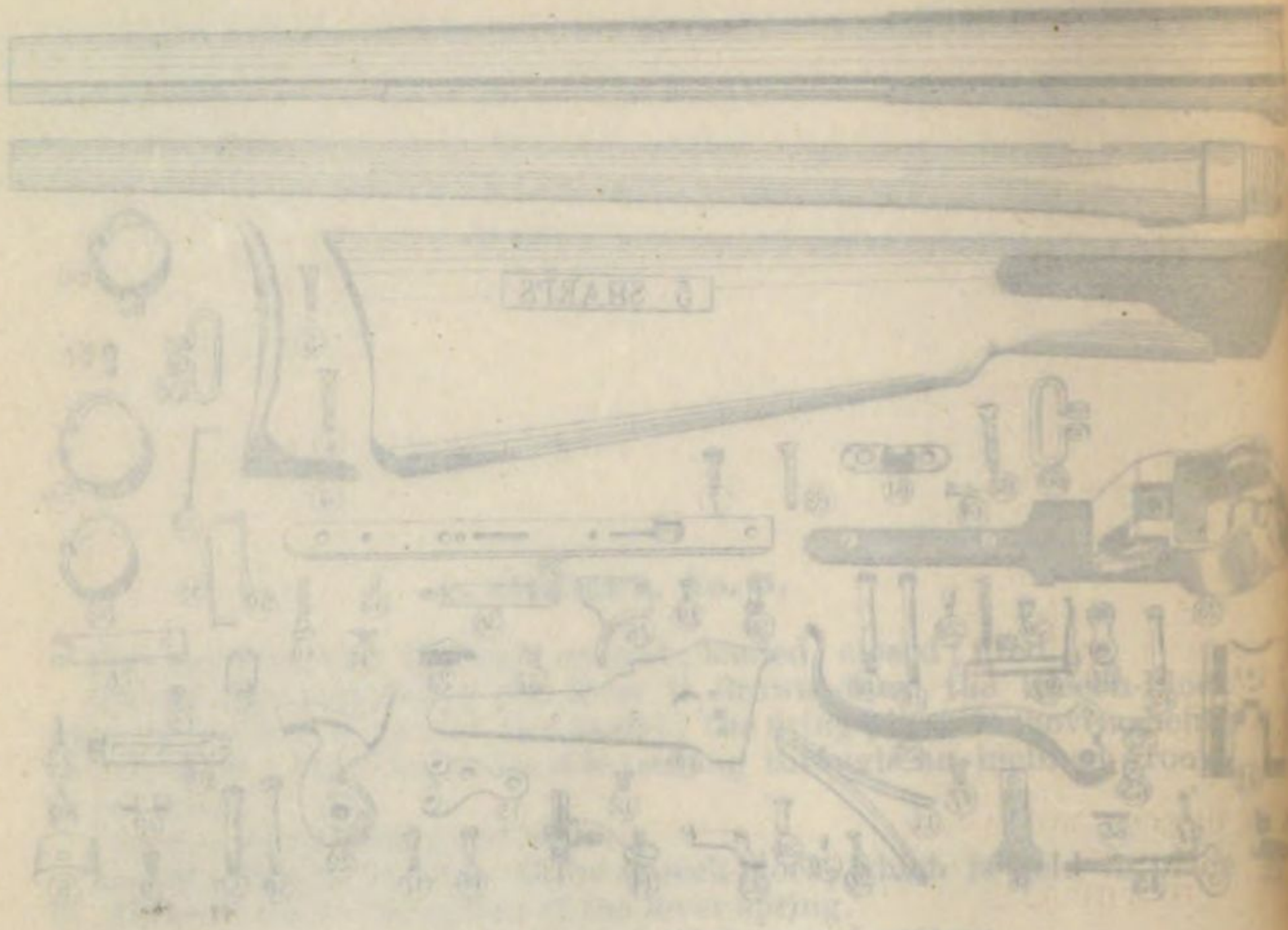
28 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel, Front Sight and Recoil Stud,
- 3 Butt Plate,
- 4 Butt Plate Screw,
- 5 Butt Plate Screw,
- 8 Tip,
- 9 Tip Screw,
- 52 Upper Band,
- 53 Upper Band Spring,
- 54 Middle Band,

- 56 Middle Band Swivel,
- 57 Middle Band Swivel Scr.,
- 55 Middle Band Spring,
- 58 Lower Band,
- 59 Lower Band Spring,
- 67 Rear Sight Base,
- 68 Rear Sight Leaf,
- 69 Rear Sight Leaf Screw,
- 70 Rear Sight Leaf Slide,
- 71 Rear Sight Spring,

- 72 Rear Sight Spring Screw,
- 73 Rear Sight Joint Pin,
- 60 Butt Stock Swivel,
- 61 Butt Stock Swivel Plate,
- 62 Butt Stock Swivel Plate Screw,
- 63 Butt Stock Swivel Plate Screw,
- 64 Butt Stock Swivel Screw.

SHARPS, No. 5.



1. Shaft
 2. Pulley
 3. Belt
 4. Frame
 5. Shaft
 6. Pulley
 7. Belt
 8. Frame
 9. Shaft
 10. Pulley
 11. Belt
 12. Frame
 13. Shaft
 14. Pulley
 15. Belt
 16. Frame
 17. Shaft
 18. Pulley
 19. Belt
 20. Frame
 21. Shaft
 22. Pulley
 23. Belt
 24. Frame
 25. Shaft
 26. Pulley
 27. Belt
 28. Frame
 29. Shaft
 30. Pulley
 31. Belt
 32. Frame
 33. Shaft
 34. Pulley
 35. Belt
 36. Frame
 37. Shaft
 38. Pulley
 39. Belt
 40. Frame
 41. Shaft
 42. Pulley
 43. Belt
 44. Frame
 45. Shaft
 46. Pulley
 47. Belt
 48. Frame
 49. Shaft
 50. Pulley
 51. Belt
 52. Frame
 53. Shaft
 54. Pulley
 55. Belt
 56. Frame
 57. Shaft
 58. Pulley
 59. Belt
 60. Frame
 61. Shaft
 62. Pulley
 63. Belt
 64. Frame
 65. Shaft
 66. Pulley
 67. Belt
 68. Frame
 69. Shaft
 70. Pulley
 71. Belt
 72. Frame
 73. Shaft
 74. Pulley
 75. Belt
 76. Frame
 77. Shaft
 78. Pulley
 79. Belt
 80. Frame
 81. Shaft
 82. Pulley
 83. Belt
 84. Frame
 85. Shaft
 86. Pulley
 87. Belt
 88. Frame
 89. Shaft
 90. Pulley
 91. Belt
 92. Frame
 93. Shaft
 94. Pulley
 95. Belt
 96. Frame
 97. Shaft
 98. Pulley
 99. Belt
 100. Frame

PARTS NOT PRELIMINARY TO THE STATE, OR CORRESPOND TO ALL PARTS	
1. Shaft	2. Pulley
3. Belt	4. Frame
5. Shaft	6. Pulley
7. Belt	8. Frame
9. Shaft	10. Pulley
11. Belt	12. Frame
13. Shaft	14. Pulley
15. Belt	16. Frame
17. Shaft	18. Pulley
19. Belt	20. Frame
21. Shaft	22. Pulley
23. Belt	24. Frame
25. Shaft	26. Pulley
27. Belt	28. Frame
29. Shaft	30. Pulley
31. Belt	32. Frame
33. Shaft	34. Pulley
35. Belt	36. Frame
37. Shaft	38. Pulley
39. Belt	40. Frame
41. Shaft	42. Pulley
43. Belt	44. Frame
45. Shaft	46. Pulley
47. Belt	48. Frame
49. Shaft	50. Pulley
51. Belt	52. Frame
53. Shaft	54. Pulley
55. Belt	56. Frame
57. Shaft	58. Pulley
59. Belt	60. Frame
61. Shaft	62. Pulley
63. Belt	64. Frame
65. Shaft	66. Pulley
67. Belt	68. Frame
69. Shaft	70. Pulley
71. Belt	72. Frame
73. Shaft	74. Pulley
75. Belt	76. Frame
77. Shaft	78. Pulley
79. Belt	80. Frame
81. Shaft	82. Pulley
83. Belt	84. Frame
85. Shaft	86. Pulley
87. Belt	88. Frame
89. Shaft	90. Pulley
91. Belt	92. Frame
93. Shaft	94. Pulley
95. Belt	96. Frame
97. Shaft	98. Pulley
99. Belt	100. Frame

SHAFT NO. 1

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH ROTATES ABOUT AN AXIS PARALLEL TO THE AXIS OF THE BARREL AND—

1.—BELOW IT.

WERNDL.

WERNDL.—AUSTRIAN.

Five motions: Cocked; opened; loaded; closed; fired.

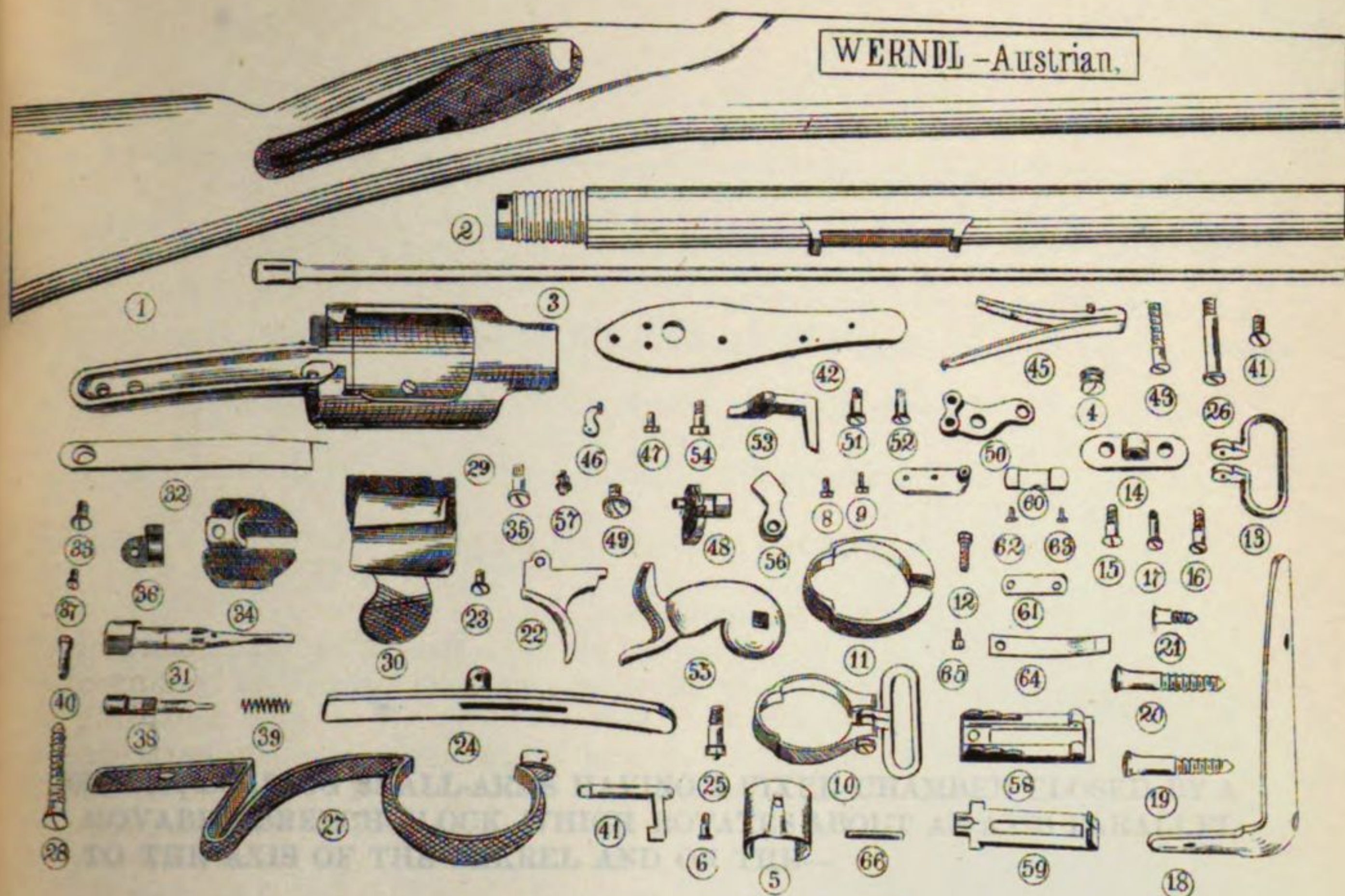
Opened.—By drawing back the nose of the hammer from the counter-bore of the firing-pin hole, so as to allow the breech-block to be turned bottom-side upward by the handle on its side. This exposes a loading-groove, cut in the bottom of the breech-block, by which the cartridge may be inserted into the chamber. A V-shaped cam at the end of the rear journal of the base-pin, with which the block revolves, bears against a flat spring placed in the ordinary position of the tang of the breech-screw, and after passing the centers assists in opening and closing the piece.

Closed.—By reversing the movement of the block it is kept in place by the pressure of the spring above referred to on one of the faces of the cam.

Fired.—By a back-action side-lock of the usual pattern.

Extraction.—By what is essentially a bent lever pivoted below the mouth of the chamber, one arm of it playing by means of a stud on its inner surface within a helical groove in the periphery of the breech-block.

Ejection.—By the acceleration impressed on the block by the flat spring above referred to, when in opening the piece, the resistance of the spring is no longer directed toward the axis of revolution.



37 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

SIXTEEN principal metallic parts not otherwise mentioned:

- 22 Trigger,
- 24 Trigger Plate,
- 27 Guard Plate,
- 29 Receiver,
- 30 Breech Block,
- 31 Breech Block Base Pin,
- 34 Breech Block Cam Plate,
- 36 Breech Block Base Pin Guide,
- 38 Firing Pin,
- 41 Extractor,
- 42 Lock Plate,

- 46 Main Spring Swivel,
- 48 Tumbler,
- 50 Bridle,
- 53 Sear,
- 55 Hammer.

FIFTEEN Screws:

- 23 Trigger Screw,
- 25 Trigger Plate Screw,
- 26 Tang Screw,
- 28 Guard Plate Screw,
- 33 Breech Block Base Pin Spring Screw,
- 35 Breech Block Cam Plate Screw,
- 37 Breech Block Base Pin Guide Screw,

- 40 Firing Pin Stop Screw,
- 43 Lock Plate Screw,
- 44 Lock Plate Screw,
- 47 Main Spring Stop Screw,
- 49 Tumbler Screw,
- 51 Bridle Screw,
- 52 Bridle Screw,
- 54 Sear Screw.

THREE Springs:

- 32 Breech Block Base Pin Spring,
- 39 Firing Pin Spring,
- 45 Main Spring.

Two other minor parts:

- 56 Hammer Pad, (Leather),
- 57 Hammer Pad Stud.

33 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 2 Barrel and Front Sight,
- 3 Ramrod,
- 4 Ramrod Stop,
- 5 Tip,
- 6 Tip Screw,
- 7 Tip Screw Plate,
- 8 Tip Screw Plate Screw,
- 9 Tip Screw Plate Screw,
- 10 Upper Band, Swivel, Scr'w and Washer,
- 11 Lower Band,

- 12 Lower Band Screw,
- 13 Swivel,
- 14 Swivel Plate,
- 15 Swivel Plate Screw,
- 16 Swivel Plate Screw,
- 17 Swivel Plate Joint Screw,
- 18 Butt Plate,
- 19 Butt Plate Screw,
- 20 Butt Plate Screw,
- 21 Butt Plate Screw,
- 58 Rear Sight Base,

- 59 Rear Sight Leaf,
- 60 Rear Sight Leaf Slide,
- 61 Rear Sight Leaf Slide Cap,
- 62 Rear Sight Leaf Slide Cap Screw,
- 63 Rear Sight Leaf Slide Cap Screw,
- 64 Rear Sight Spring,
- 65 Rear Sight Spring Screw,
- 66 Rear Sight Joint Pin.

WERNDL, (AUSTRIAN).

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH ROTATES ABOUT AN AXIS PARALLEL TO THE AXIS OF THE BARREL AND ON THE—

1.—RIGHT SIDE.

SNELL.

2.—LEFT SIDE.

EARNEST.

SNELL, Nos. 33 AND 62.

Four motions, viz: Opened; empty shell extracted; loaded; fired.

Opened.—By bringing the hammer to the full-cock.

Closed.—By firing the piece, the hammer falls behind the cartridge head and is—

Locked.—By engaging in a groove in the frame.

Fired.—By a center-lock, the hammer striking a side-fire cartridge directly, by a projection near its outer edge.

Extraction.—By a sliding-piece operated independently by the hand, and serving to guard the cartridge against an accidental fall of the hammer while loading.

The friction-spring over the point of which the rim of the cartridge rides in loading, serves to keep the cartridge in the chamber while the hammer is cocked.

Gun No. 33 was withdrawn before being photographed.

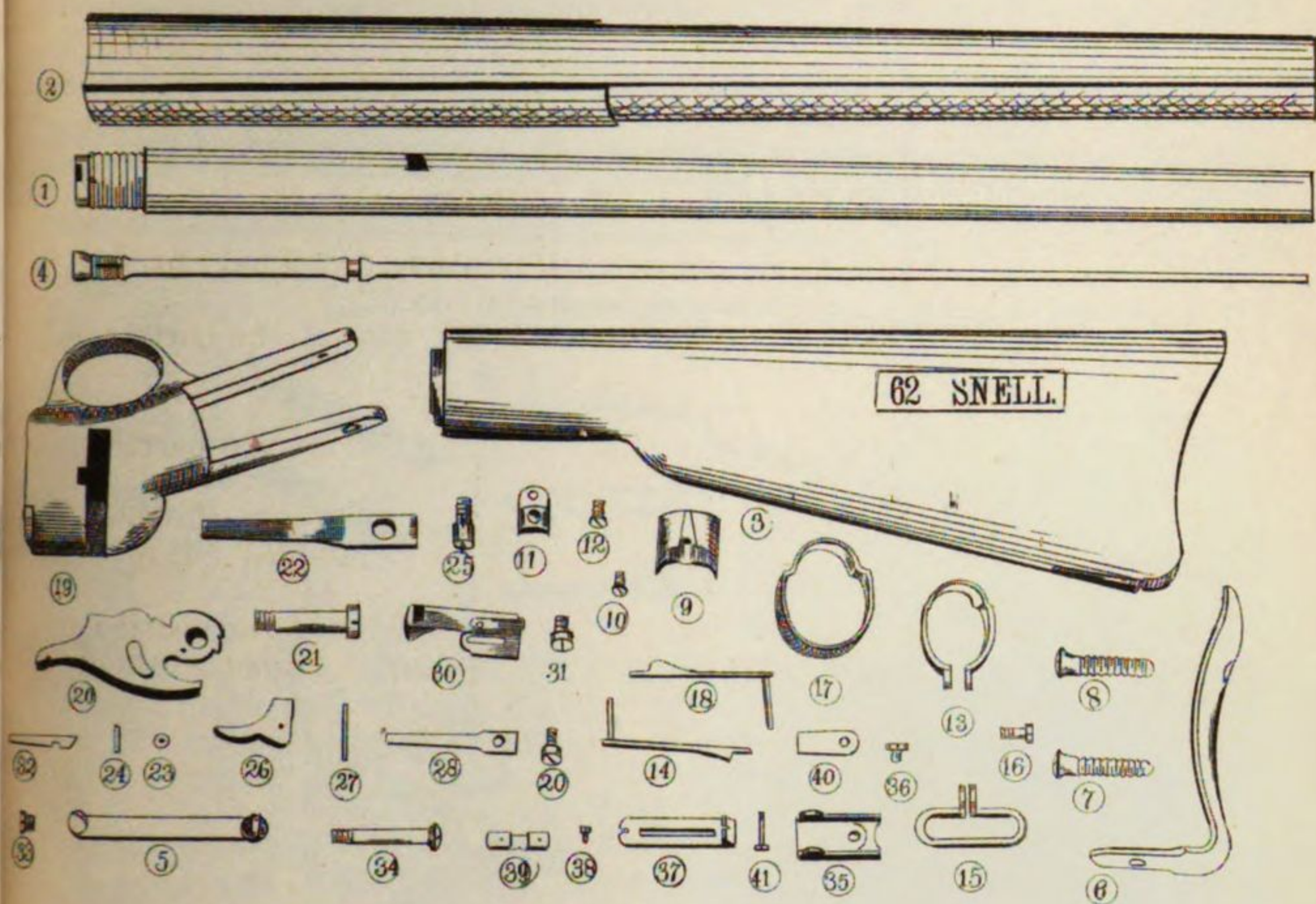
EARNEST, No. 65.

Withdrawn before being photographed.

This arm has a breech-block swinging on an axis parallel to that of the barrel, and to the left of it. The block is in two sections, the foremost of which revolves with a screw motion on that in rear, which alone is fastened to the hinge. They are both perforated for the firing-pin and striker. The forward section is provided with a handle by which the breech is opened and closed, receding from and approaching the barrel alternately.

The lock is peculiar, involving a device for causing the striker to rebound after delivering its blow upon the firing-pin.

The arm is especially designed to prevent the escape of gas from defective cartridges.



24 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

TWO of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

FIVE principal metallic parts not otherwise mentioned:

- 19 Frame,
- 20 Hammer,
- 20 Firing Stud,
- 26 Trigger,
- 30 Extractor.

SEVEN Screws:

- 12 Recoil Stud Screw,
- 21 Hammer Screw,
- 25 Main Spring Screw,
- 29 Trigger Spring Screw,
- 31 Extractor Screw,
- 33 Ejector Spring Screw,
- 34 Tang Screw.

THREE Pins:

- 24 Main Spring Friction Roll Pin,

- 27 Trigger Pin,
- 30 Extractor Spring Pin.

FOUR Springs:

- 22 Main Spring,
- 28 Trigger Spring,
- 30 Extractor Friction Spr'g,
- 32 Friction Spring.

THREE other minor parts:

- 11 Recoil Stud,
- 11 Recoil Stud Dowel Pin,
- 23 Main Spring Friction Roll.

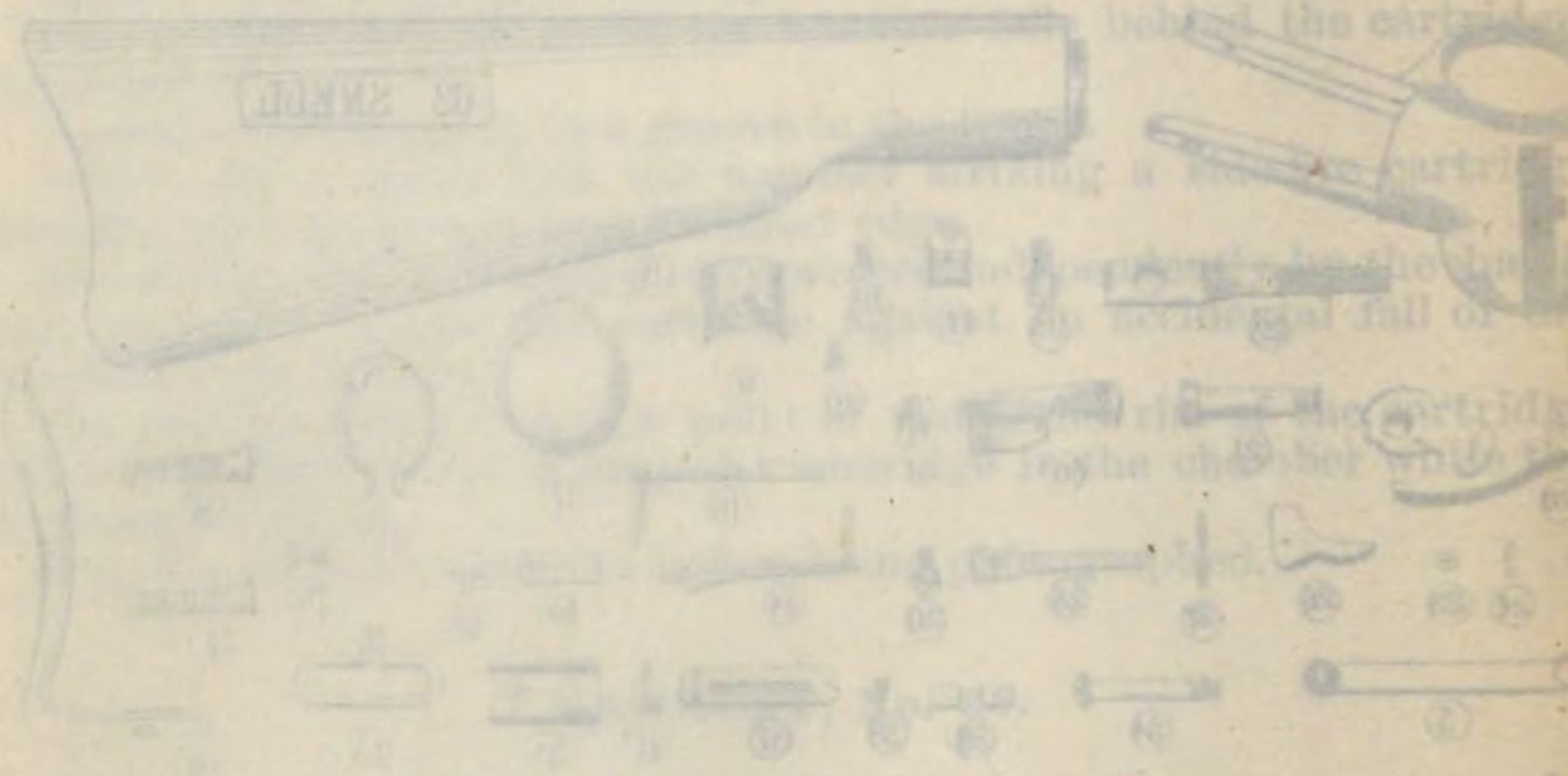
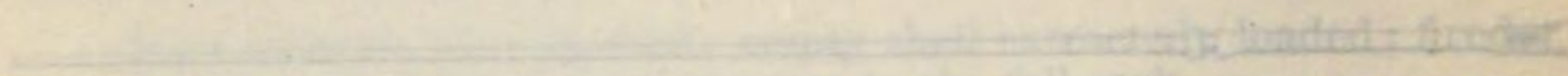
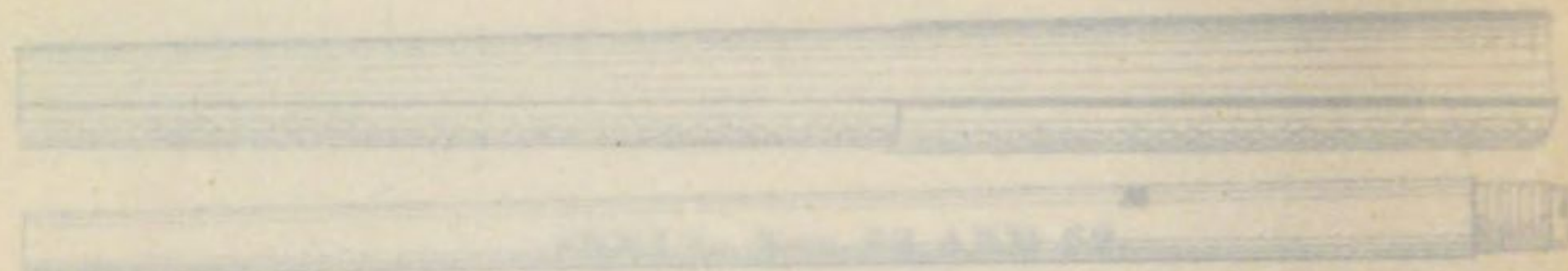
22 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Ramrod Stop,
- 6 Butt Plate,
- 7 Butt Plate Screw,
- 8 Butt Plate Screw,
- 9 Tip,

- 10 Tip Screw,
- 13 Upper Band,
- 14 Upper Band Spring,
- 15 Upper Band Swivel,
- 16 Upper Band Screw,
- 17 Lower Band,
- 18 Lower Band Spring,

- 35 Rear Sight Base,
- 36 Rear Sight Base Screw,
- 37 Rear Sight Leaf,
- 38 Rear Sight Leaf Screw,
- 39 Rear Sight Leaf Slide,
- 40 Rear Sight Spring,
- 41 Rear Sight Joint Screw.

SNELL, No. 62.

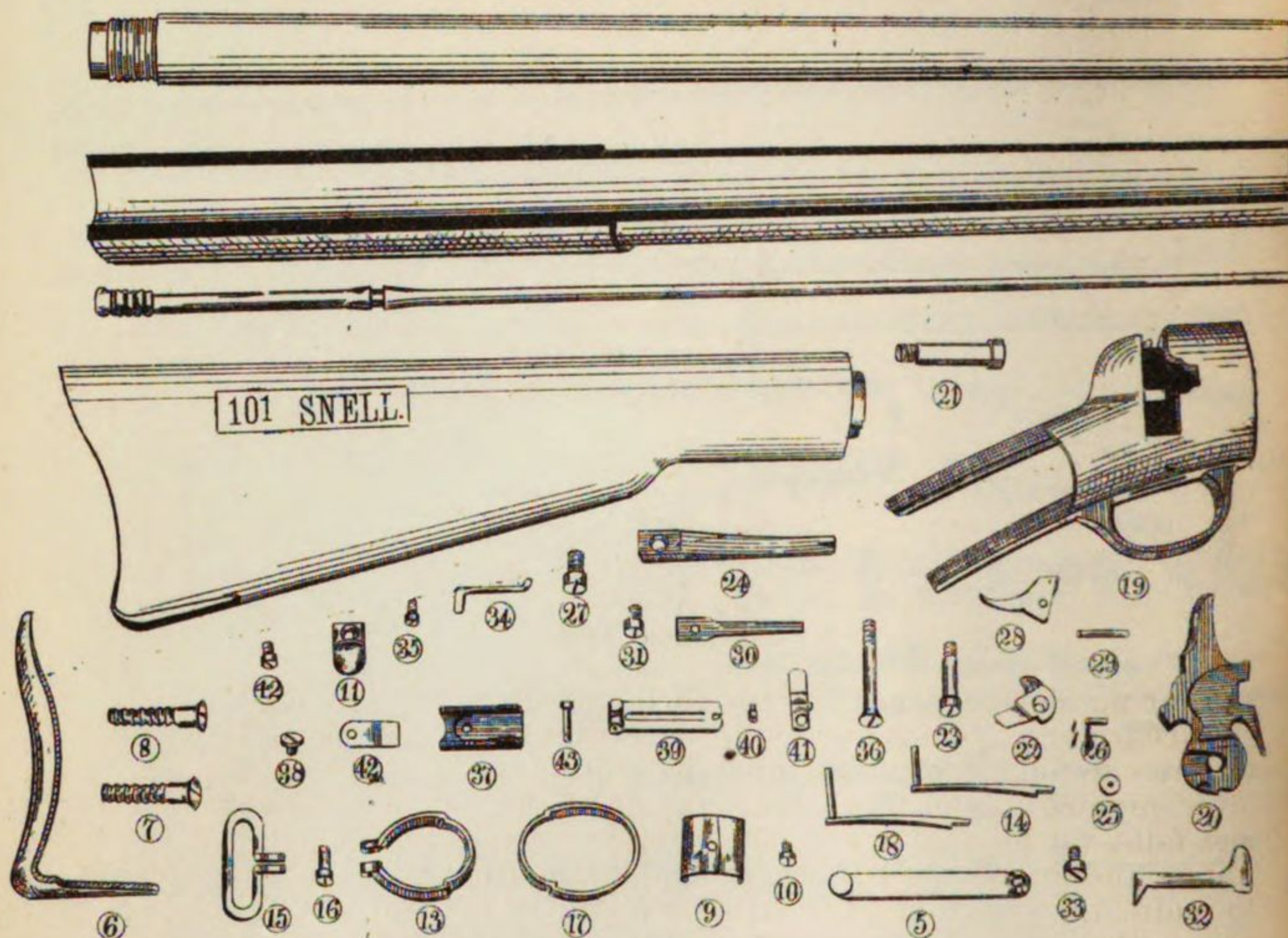


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1	Tip Stock	11	Hammer
2	Hammer	12	Hammer
3	Hammer	13	Hammer
4	Hammer	14	Hammer
5	Hammer	15	Hammer
6	Hammer	16	Hammer
7	Hammer	17	Hammer
8	Hammer	18	Hammer
9	Hammer	19	Hammer
10	Hammer	20	Hammer

1	Tip Stock	11	Hammer
2	Hammer	12	Hammer
3	Hammer	13	Hammer
4	Hammer	14	Hammer
5	Hammer	15	Hammer
6	Hammer	16	Hammer
7	Hammer	17	Hammer
8	Hammer	18	Hammer
9	Hammer	19	Hammer
10	Hammer	20	Hammer

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23 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

FIVE principal metallic parts not otherwise mentioned:

- 19 Frame,
- 20 Hammer,
- 22 Firing Pin,
- 28 Trigger,
- 32 Extractor,

EIGHT Screws:

- 12 Recoil Stud Screw
- 21 Hammer Screw,
- 23 Firing Pin Screw,
- 27 Main Spring Screw,
- 31 Trigger Spring Screw,
- 33 Extractor Screw,
- 35 Friction Spring Screw,
- 36 Tang Screw.

Two Pins:

- 26 Main Spring Friction Roll Pin,

- 29 Trigger Pin.

THREE Springs:

- 24 Main Spring,
- 30 Trigger Spring,
- 34 Ejector Spring.

THREE other minor parts:

- 11 Recoil Stud,
- 11 Recoil Stud Dowel Pin.
- 25 Main Spring Friction Roll.

22 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Ramrod Stop,
- 6 Butt Plate,
- 7 Butt Plate Screw,
- 8 Butt Plate Screw,
- 9 Tip,

- 10 Tip Screw,
- 13 Upper Band,
- 14 Upper Band Spring,
- 15 Upper Band Swivel,
- 16 Upper Band Swivel Scr.,
- 17 Lower Band,
- 18 Lower Band Spring,

- 37 Rear Sight Base,
- 38 Rear Sight Base Screw,
- 39 Rear Sight Leaf,
- 40 Rear Sight Leaf Screw,
- 41 Rear Sight Leaf Slide,
- 42 Rear Sight Spring,
- 43 Rear Sight Joint Screw

SNELL, No 101.

SNELL, No. 101.

Four motions: Opened; empty shell extracted; loaded; fired.

This arm resembles generally No. 62, except that it is intended for a center-fire cartridge, which is ignited by a firing-pin in the form of a bent lever, pivoted on the front and left side of the hammer. As the hammer falls, the forward arm of the firing-pin strikes the right side of the frame, and throws the left arm around to the front with sufficient force to ignite the cartridge; the striking of the forward arm of the firing-pin on the frame, being so timed that the fulminate shall be ignited just as the breech is closed.

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BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, ROTATING ABOUT A VERTICAL AXIS AT 90° TO THE AXIS OF THE BARREL, AND—

1.—LYING IN THE PLANE OF THE AXIS OF THE BARREL.

FREEMAN, No. 59.

FREEMAN, No. 76.

FREEMAN, No. 59.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—By cocking the piece and pulling back the horn of the breech-block.

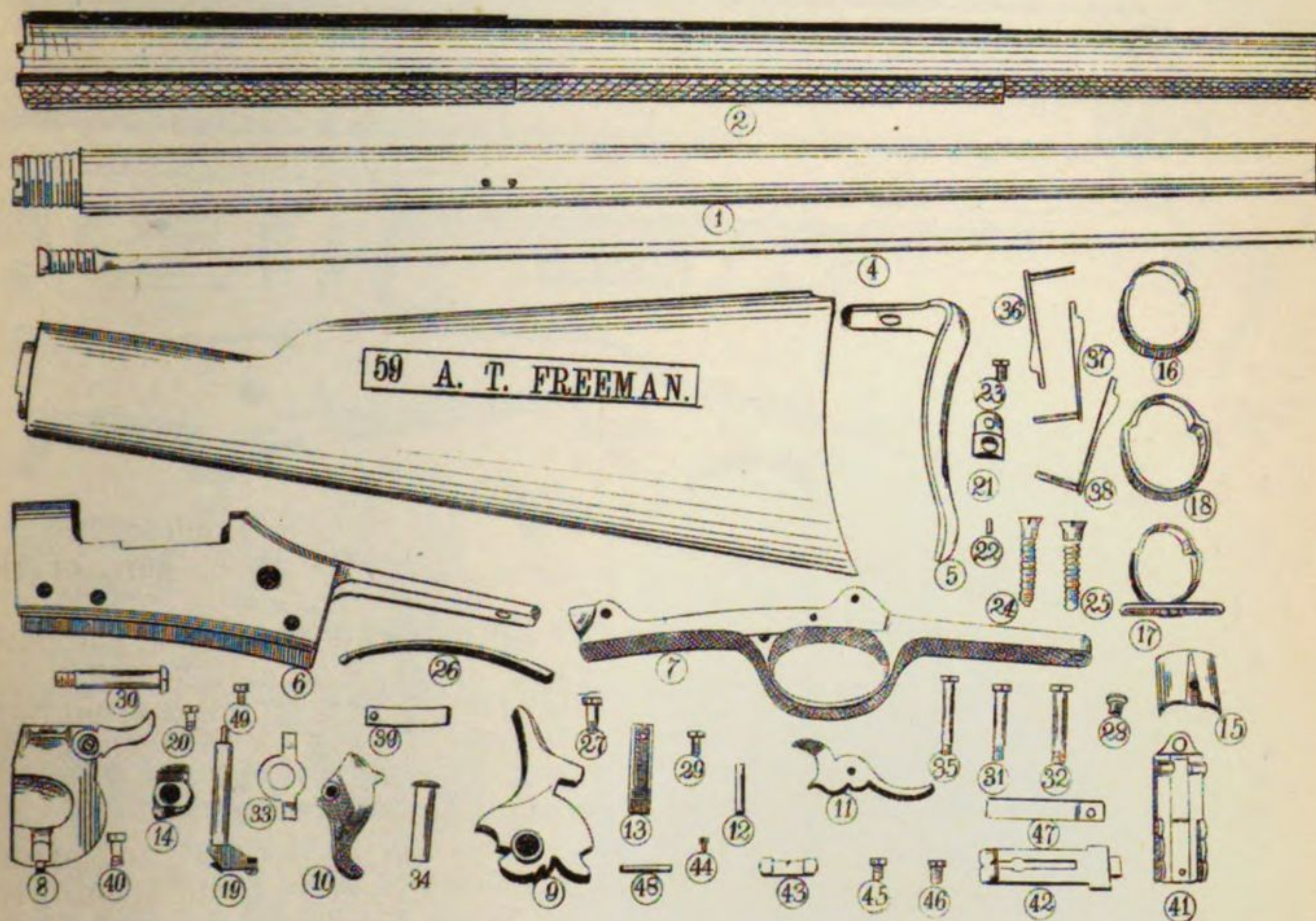
Closed.—By pushing the horn forward with the right hand, the bevel on the left face of the breech-block pushing the cartridge home.

Locked.—By the position of the breech-block, it is also kept from turning, by the front segment of the hammer engaging with a corresponding groove in the back of the block.

Fired.—By a center-lock of the usual pattern.

Extraction.—By a bent lever pivoted below the chamber and struck by the extractor-cam, which turning with the breech-block in opening the piece, rides over the curved horn of the extractor and draws back its upper end, carrying with it the cartridge-shell.

Ejection.—By a flat spring riding on a cam formed on the hub of the extractor, and thereby accelerating its action on the cartridge-shell when the latter has been started from its seat in the chamber in the act of opening the piece.



28 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 2 Tip Stock,
- 3 Butt Stock.

EIGHT principal metallic parts not otherwise mentioned :

- 6 Frame,
- 8 Breech Block,
- 19 Firing Pin,
- 14 Extractor Cam,
- 9 Hammer,
- 10 Extractor,
- 7 Guard,

11 Trigger.

ELEVEN Screws :

- 20 Firing Pin Screw,
- 40 Breech Block Stud Scr.,
- 34 Hammer Screw,
- 35 Extractor Hinge Screw,
- 49 Ejector Spring Screw,
- 27 Main Spring Screw,
- 29 Trigger Spring Screw,
- 31 Guard Plate Screw,
- 32 Guard Plate Screw,
- 30 Tang Screw,

23 Recoil Stud Screw.

ONE Pin :

12 Trigger Pin.

FOUR Springs :

- 33 Br'ch Block Friction Sp'g,
- 39 Ejector Spring,
- 13 Trigger Spring,
- 26 Main Spring.

Two other minor parts :

- 21 Recoil Stud,
- 22 Recoil Stud Dowel Pin.

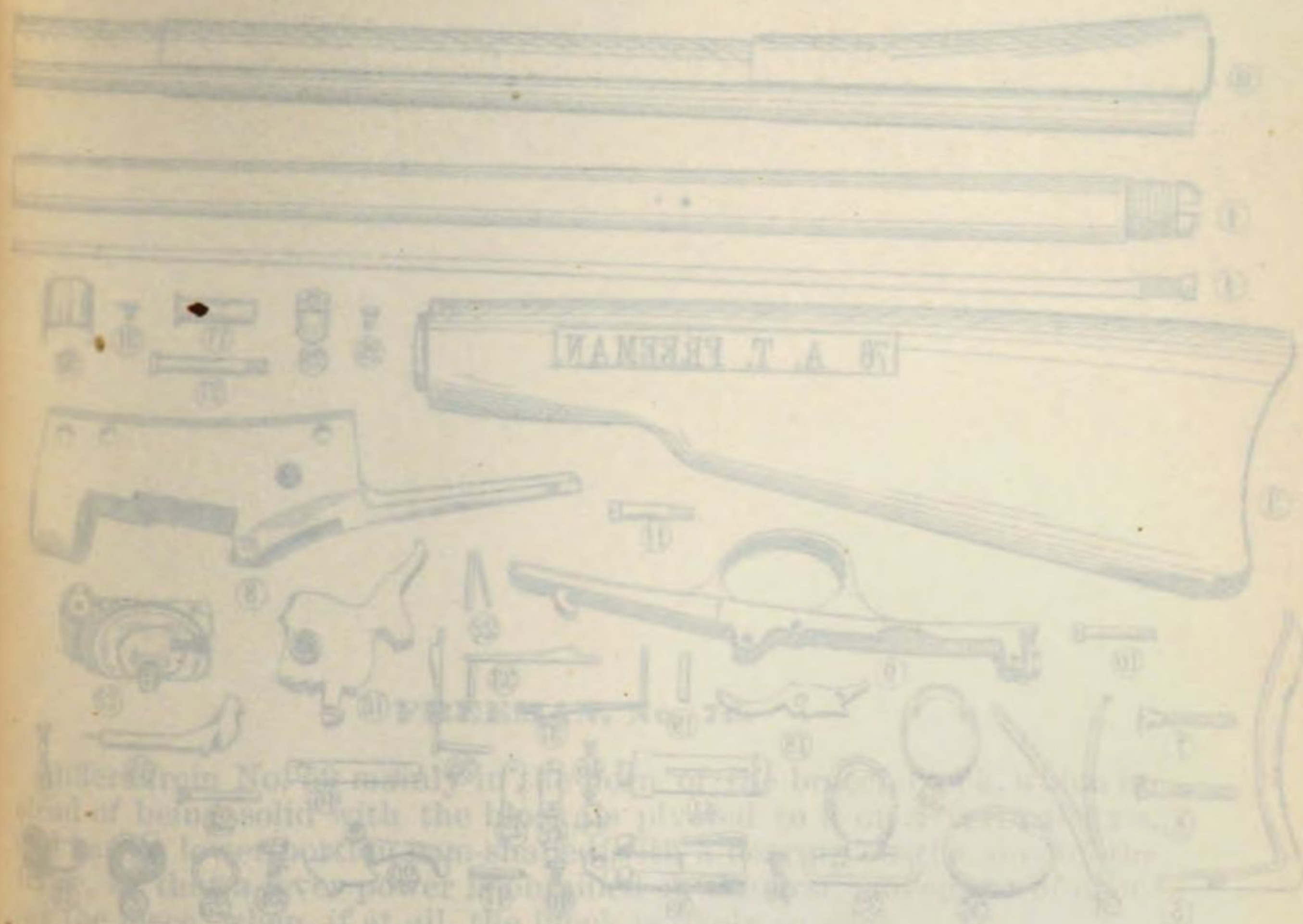
26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 24 Butt Plate Screw,
- 25 Butt Plate Screw,
- 15 Tip,
- 28 Tip Screw,
- 16 Upper Band, Swivel & Pin,

- 36 Upper Band Spring,
- 17 Middle Band,
- 37 Middle Band Spring,
- 18 Lower Band,
- 38 Lower Band Spring,
- 41 Rear Sight Base,
- 42 Rear Sight Leaf,
- 43 Rear Sight Leaf Slide,

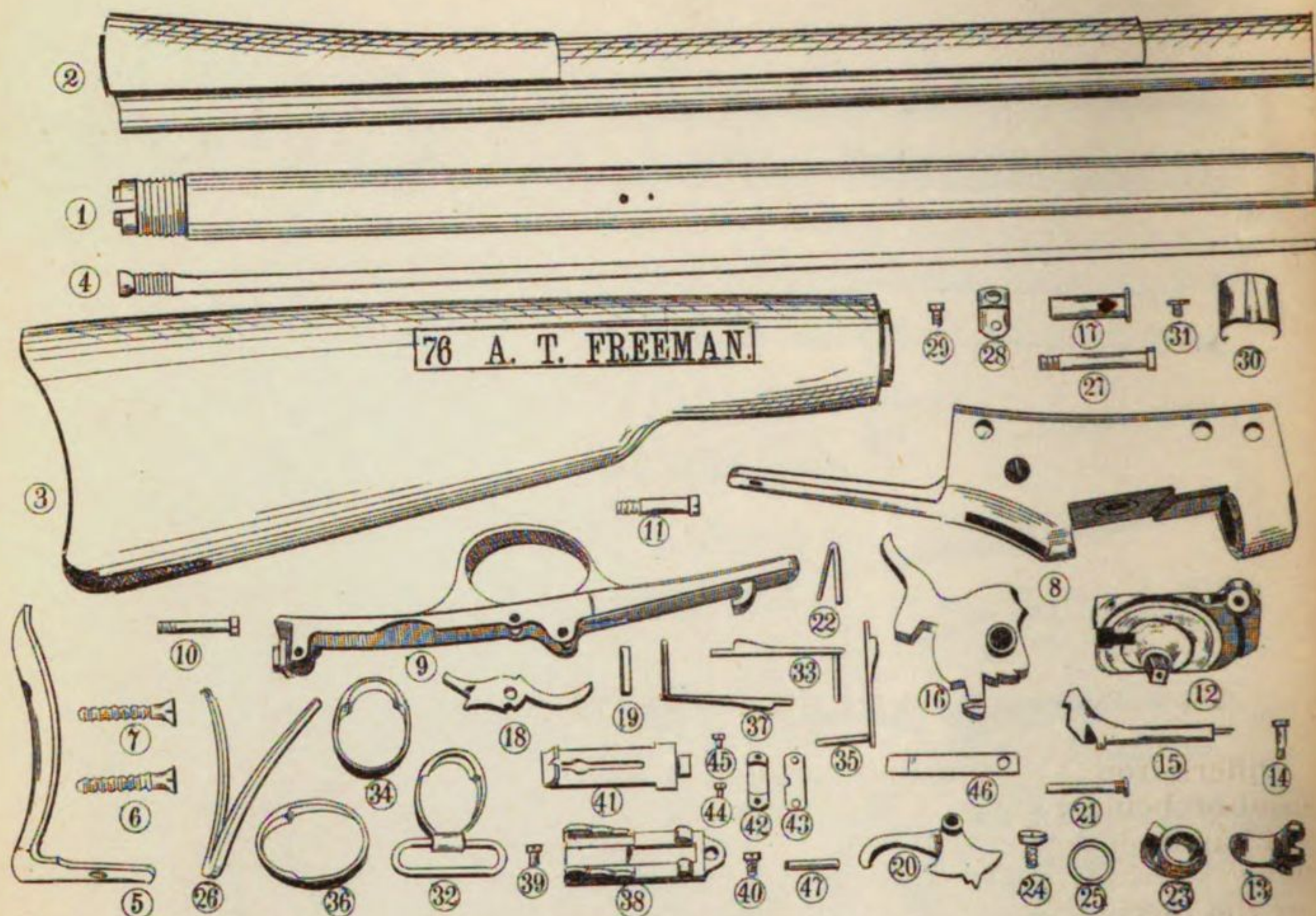
- 44 Rear Sight Leaf Screw,
- 45 Rear Sight Base Screw,
- 46 Rear Sight Base Screw,
- 47 Rear Sight Spring,
- 48 Rear Sight Joint Pin,
- 7 Guard Swivel and Pin.

FREEMAN, No. 50.



These parts are essential to the system, and are common to all arms. The parts are shown in the accompanying drawings, and are described in the following list.

PARTS COMMON TO THE SYSTEM, OR COMMON TO ALL ARMS.		PARTS ESSENTIAL TO THE SYSTEM.	
1. Trigger Pin.	19. Trigger Pin.	1. Trigger Pin.	19. Trigger Pin.
2. Trigger Spring.	20. Trigger Spring.	2. Trigger Spring.	20. Trigger Spring.
3. Trigger Pin.	21. Trigger Pin.	3. Trigger Pin.	21. Trigger Pin.
4. Trigger Spring.	22. Trigger Spring.	4. Trigger Spring.	22. Trigger Spring.
5. Trigger Pin.	23. Trigger Pin.	5. Trigger Pin.	23. Trigger Pin.
6. Trigger Spring.	24. Trigger Spring.	6. Trigger Spring.	24. Trigger Spring.
7. Trigger Pin.	25. Trigger Pin.	7. Trigger Pin.	25. Trigger Pin.
8. Trigger Spring.	26. Trigger Spring.	8. Trigger Spring.	26. Trigger Spring.
9. Trigger Pin.	27. Trigger Pin.	9. Trigger Pin.	27. Trigger Pin.
10. Trigger Spring.	28. Trigger Spring.	10. Trigger Spring.	28. Trigger Spring.
11. Trigger Pin.	29. Trigger Pin.	11. Trigger Pin.	29. Trigger Pin.
12. Trigger Spring.	30. Trigger Spring.	12. Trigger Spring.	30. Trigger Spring.
13. Trigger Pin.	31. Trigger Pin.	13. Trigger Pin.	31. Trigger Pin.
14. Trigger Spring.	32. Trigger Spring.	14. Trigger Spring.	32. Trigger Spring.
15. Trigger Pin.	33. Trigger Pin.	15. Trigger Pin.	33. Trigger Pin.
16. Trigger Spring.	34. Trigger Spring.	16. Trigger Spring.	34. Trigger Spring.
17. Trigger Pin.	35. Trigger Pin.	17. Trigger Pin.	35. Trigger Pin.
18. Trigger Spring.	36. Trigger Spring.	18. Trigger Spring.	36. Trigger Spring.



25 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

NINE principal metallic parts not otherwise mentioned:

- 8 Frame,
- 9 Guard Plate,
- 12 Breech Block,
- 13 Br'ch Block Thumb Piece,
- 15 Firing Pin,
- 16 Hammer,
- 18 Trigger,

- 20 Extractor,
- 23 Extractor Cam.

EIGHT Screws:

- 10 Guard Screw,
- 11 Guard Screw,
- 14 Br'ch Block Thumb Piece Screw,
- 17 Hammer Screw,
- 21 Extractor Screw,
- 24 Extractor Cam Screw,
- 27 Tang Screw,
- 29 Recoil Stud Screw.

ONE Pin:

- 19 Trigger Pin.

THREE Springs:

- 22 Extractor Spring,
- 25 Extractor Cam Friction Spring,
- 26 Main Spring.

Two other minor parts:

- 28 Recoil Stud,
- 28 Recoil Stud Dowel Pin.

26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 30 Tip,
- 31 Tip Screw,
- 32 Upper Band,
- 33 Upper Band Spring,

- 34 Middle Band, Swivel and Pin,
- 35 Middle Band Spring,
- 36 Lower Band,
- 37 Lower Band Spring,
- 38 Rear Sight Base,
- 39 Rear Sight Base Screw,
- 40 Rear Sight Base Screw,
- 41 Rear Sight Leaf,

- 42 Rear Sight Leaf Slide,
- 43 Rear Sight Leaf Slide Cap,
- 44 Rear Sight Leaf Slide Cap Screw,
- 45 Rear Sight Leaf Slide Cap Screw,
- 46 Rear Sight Spring,
- 47 Rear Sight Joint Pin.

FREEMAN, No. 76.

FREEMAN, No. 76.

Differs from No. 59 mainly in the horn of the breech-block, which instead of being solid with the block, is pivoted to it on a vertical axis, and has its lower portion cam-shaped with a bearing on the side of the frame, so that a lever power is obtained in the first movement of opening the piece, when, if at all, the block is likely to stick.

The hammer also has a projecting tooth on its forward surface which engages with a notch in the under side of the firing-pin and retracts it when the hammer is cocked. The point of the firing-pin may thus be withdrawn from its impression in the cartridge-head, in order to allow the block to open freely

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, ROTATING ABOUT A VERTICAL AXIS AT 90° TO THE AXIS OF THE BARREL, AND—

2.—NOT IN THE PLANE OF THE AXIS OF THE BARREL, (*ALL TO THE RIGHT AND IN FRONT.*)

MILBANK, No. 50.

BROUGHTON, No. 45

MILBANK, No. 50.

No photograph of this gun was taken, and not enough of it was recalled to afford ground for a description of its working, except that it was provided with a breech-block, swinging sidewise and to the right.

BROUGHTON, No. 45.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—By drawing back the firing-bolt to cock the piece, and pressing down on the thumb-piece to liberate a spring-catch in the breech-block from its notch in the receiver, and to allow the block to swing outward and forward until nearly parallel to the barrel.

Closed.—By shutting the block the spring-catch flies into place and holds the block from accidental opening until it is more securely locked.

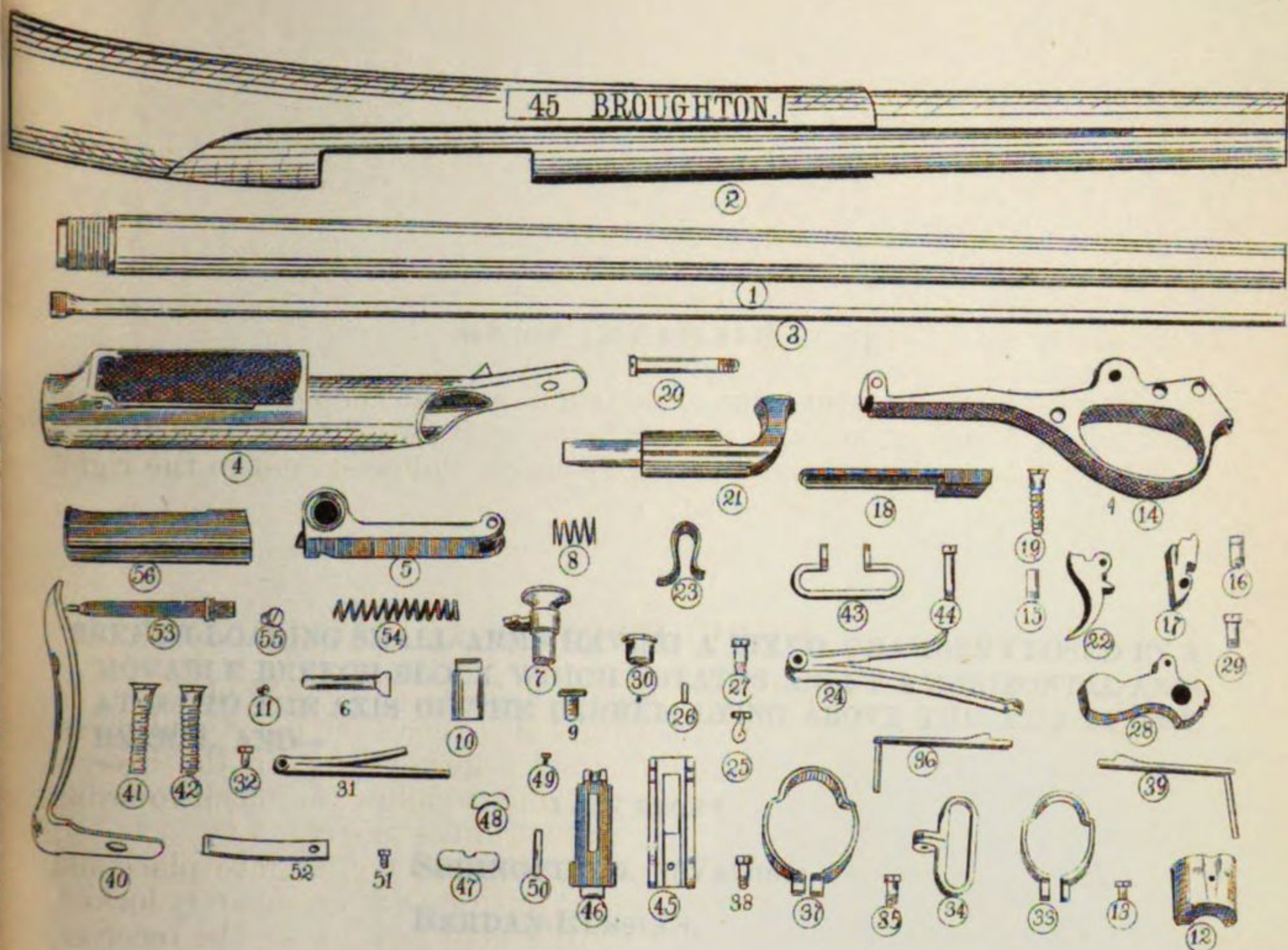
Locked.—By the sliding backward to a solid bearing on the receiver, of the inner section of the breech-block under the influence of the discharge. It is still further secured by the entrance of the nose of the firing-bolt into the counterbore of the firing-pin hole, when the piece is fired.

Fired.—By a mainspring belonging to a lock, fastened on the guard-strap, throwing forward a tumbler which plays in a recess in the under side of the firing-bolt, and carrying it forcibly against the firing-pin.

Extraction.—By an extractor fixed on the joint-pin around which the block revolves, and struck by it above the center near the close of its movement in opening.

Ejection.—By a flat spring riding over a cam on the shaft of the extractor, and accelerating its movement after the center is passed.

NOTE.—The guard is connected with the receiver by an undercut groove in front and a spring-catch in rear, and, when detached from the gun, carries with it the lock complete.



36 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

2 Stock.

FIFTEEN principal metallic parts not otherwise mentioned :

- 7 Breech Block Latch,
- 7 Thumb Piece,
- 56 Breech Block, Inner Section,
- 10 Guard Catch,
- 53 Firing Pin,
- 4 Receiver,
- 5 Breech Block, Outer Section,
- 14 Guard,
- 17 Guard Catch,

- 21 Firing Bolt,
- 22 Trigger,
- 28 Tumbler,
- 18 Tang Screw Plate,
- 30 Extractor,
- 25 Main Spring Swivel.

TEN Screws :

- 9 Breech Block Latch Scr.,
- 11 Guard Catch Screw,
- 55 Firing Pin Screw,
- 15 Trigger Screw,
- 16 Guard Catch Screw,
- 27 Main Spring Screw,
- 29 Tumbler Screw,
- 32 Ejector Screw,

- 19 Tang Screw Plate Screw,
- 20 Tang Screw.

TWO Pins :

- 6 Breech Block Joint Pin,
- 26 Main Spring Swivel Pin.

FIVE Springs :

- 8 Br'ch Block Latch Spring,
- 54 Firing Pin Spring,
- 23 Trigger Spring,
- 24 Main Spring,
- 31 Ejector Spring.

THREE other minor parts :

- 2 Tang Screw Bushing,
- 4 Ejector Stud,
- 4 Ejector Spring Stud.

25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 3 Ramrod,
- 33 Upper Band,
- 34 Upper Band Swivel,
- 35 Upper Band Screw,
- 36 Upper Band Spring,
- 37 Lower Band,
- 38 Lower Band Screw,
- 39 Lower Band Spring,

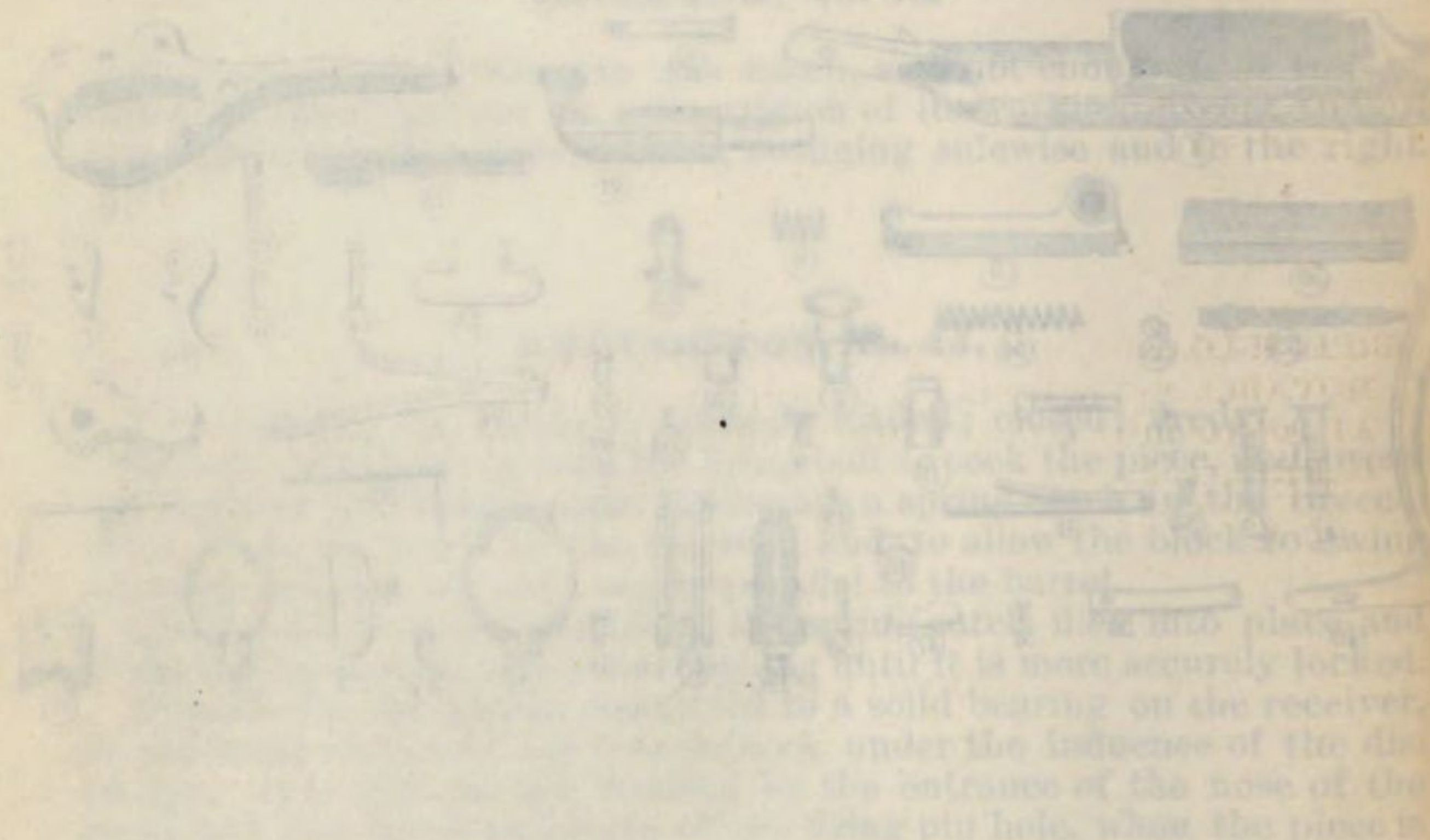
- 40 Butt Plate,
- 41 Butt Plate Screw,
- 42 Butt Plate Screw,
- 12 Tip,
- 13 Tip Screw,
- 45 Rear Sight Base,
- 46 Rear Sight Leaf,
- 47 Rear Sight Leaf Slide,

- 48 Rear Sight Leaf Slide Stop,
- 49 Rear Sight Leaf Slide Stop Screw,
- 50 Rear Sight Joint Pin,
- 51 Rear Sight Base Screw,
- 52 Rear Sight Spring,
- 43 Guard Swivel,
- 44 Guard Swivel Screw.

BROUGHTON, No. 45.

ARTICLE 1

SECTION 1



ARTICLE 2

1. The President shall have the honor and pleasure of appointing and removing the Secretary of the Navy, with the advice and consent of the Senate.	2. The Secretary of the Navy shall be a citizen of the United States, and shall hold office for a term of four years, unless sooner removed by the President.
3. The Secretary of the Navy shall be the chief executive officer of the Department of the Navy, and shall see that the laws are faithfully executed.	4. The Secretary of the Navy shall have the honor and pleasure of appointing and removing all officers and employees of the Department of the Navy, with the exception of those officers and employees who are appointed and removed by the President.
5. The Secretary of the Navy shall have the honor and pleasure of appointing and removing all officers and employees of the Department of the Navy, with the exception of those officers and employees who are appointed and removed by the President.	6. The Secretary of the Navy shall have the honor and pleasure of appointing and removing all officers and employees of the Department of the Navy, with the exception of those officers and employees who are appointed and removed by the President.

ARTICLE 3

1. The Secretary of the Navy shall have the honor and pleasure of appointing and removing all officers and employees of the Department of the Navy, with the exception of those officers and employees who are appointed and removed by the President.	2. The Secretary of the Navy shall have the honor and pleasure of appointing and removing all officers and employees of the Department of the Navy, with the exception of those officers and employees who are appointed and removed by the President.
3. The Secretary of the Navy shall have the honor and pleasure of appointing and removing all officers and employees of the Department of the Navy, with the exception of those officers and employees who are appointed and removed by the President.	4. The Secretary of the Navy shall have the honor and pleasure of appointing and removing all officers and employees of the Department of the Navy, with the exception of those officers and employees who are appointed and removed by the President.

SECTION 2

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH ROTATES ABOUT A HORIZONTAL AXIS AT 90° TO THE AXIS OF THE BARREL, LYING ABOVE THE AXIS OF THE BARREL, AND—

1.—IN FRONT.

SPRINGFIELD. (Various.)

BERDAN-RUSSIAN.

MORGENSTERN.

BROUGHTON, No. 79.

SPRINGFIELD, MODEL 1870, No. 48.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—By half or full cocking the hammer, and then pressing on the thumb-piece of the cam-latch until the breech-block is free to swing upward and forward over the barrel.

Closed.—By shutting the block the latch flies into place under the influence of the cam-latch spring.

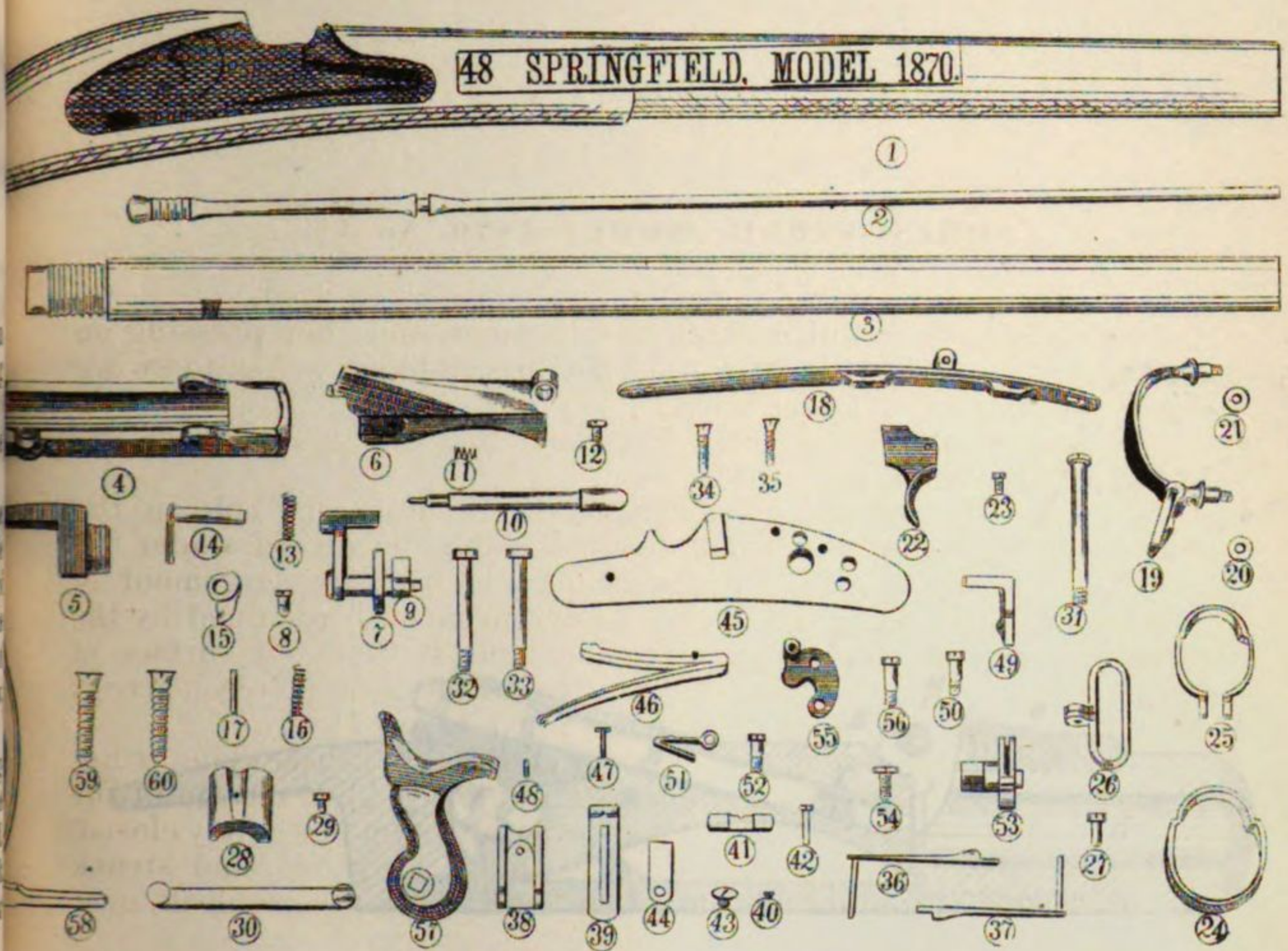
Locked.—By the horizontal elongation of the hinge-pin hole in the breech-block, allowing the block to slide bodily backward under the influence of the discharge. By this means and by the enlargement of the cam-shaft hole, a bearing in the line of the barrel is obtained by the interposition of the cam, which, abutting against the front surface of its recess in the block, transfers the recoil to the face of the breech-screw, without subjecting the shaft on which it turns to any strain.

Fired.—By a front-action side-lock of the usual pattern. The firing-pin guard on the thumb-piece, prevents an unexpected discharge of the piece, in case the hammer should fall, before the breech is securely closed.

Extraction.—By an extractor swinging on the hinge-pin, and struck above its center of motion by the forward end of the breech-block, near the completion of its movement in opening.

Ejection.—By accelerating the movement of the extractor by means of the spiral ejector-spring, which surrounds the stem of the ejector-spindle, and bears against the bottom of its hole in the receiver at one end, and against the head of the spindle at the other end. When the extractor is revolved by the opening of the block, the ejector-spring is compressed by the ejector-spindle, the point of which rests in a cavity in the back of the extractor above its axis of motion. The continued revolution of the extractor finally brings the prolongation of the ejector-spindle below the axis of motion; as soon as the center is passed, the sudden release of the ejector-spring causes the extractor to rapidly rotate about its axis, and to carry the empty cartridge-shell against the beveled surface of the ejector-stud, by which it is deflected upward and thrown clear of the gun.

NOTE.—This is the arm issued for experimental trial in the field.



44 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

1 Stock.

EIGHTEEN principal metallic parts not otherwise mentioned :

18 Guard Plate,
19 Guard Bow,
22 Trigger,
45 Lock Plate,
57 Hammer,
53 Tumbler,
55 Bridle,
49 Sear,
6 Breech Block,
7 Breech Block Cap,
9 Cam Latch,
9 Thumb Piece,
10 Firing Pin,

4 Receiver,
5 Breech Screw,
17 Ejector Spring Spindle,
15 Extractor,
47 Main Spring Swivel.

FOURTEEN Screws :

34 Guard Screw,
35 Guard Screw,
20 Guard Bow Nut,
21 Guard Bow Nut,
23 Trigger Screw,
54 Tumbler Screw,
56 Bridle Screw,
50 Sear Screw,
52 Sear Spring Screw,
32 Side Screw,
33 Side Screw,

8 Breech Block Cap Screw,
12 Firing Pin Screw,
31 Tang Screw.

TWO Pins :

48 Main Spring Swivel Pin,
14 Hinge Pin.

FIVE Springs :

51 Sear Spring,
46 Main Spring,
13 Cam Latch Spring,
11 Firing Pin Spring,
16 Ejector Spring.

FOUR other minor parts :

4 Ejector Stud,
14 Hinge Pin Stud,
1 Side Screw Washer,
1 Side Screw Washer.

24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

58 Butt Plate,
59 Butt Plate Screw,
60 Butt Plate Screw,
24 Lower Band,
37 Lower Band Spring,
25 Upper Band,
26 Upper Band Swivel,
27 Upper Band Swivel Scr.,

36 Upper Band Spring,
2 Ramrod,
28 Tip,
29 Tip Screw,
3 Barrel and Front Sight,
38 Rear Sight Base,
43 Rear Sight Base Screw,
44 Rear Sight Spring,

39 Rear Sight Leaf,
41 Rear Sight Leaf Slide,
40 Rear Sight Leaf Screw,
42 Rear Sight Joint Screw,
30 Ramrod Stop,
19 Guard Bow Swivel and Rivet.

SPRINGFIELD, No. 48.

48 SPRINGFIELD MODEL 1901

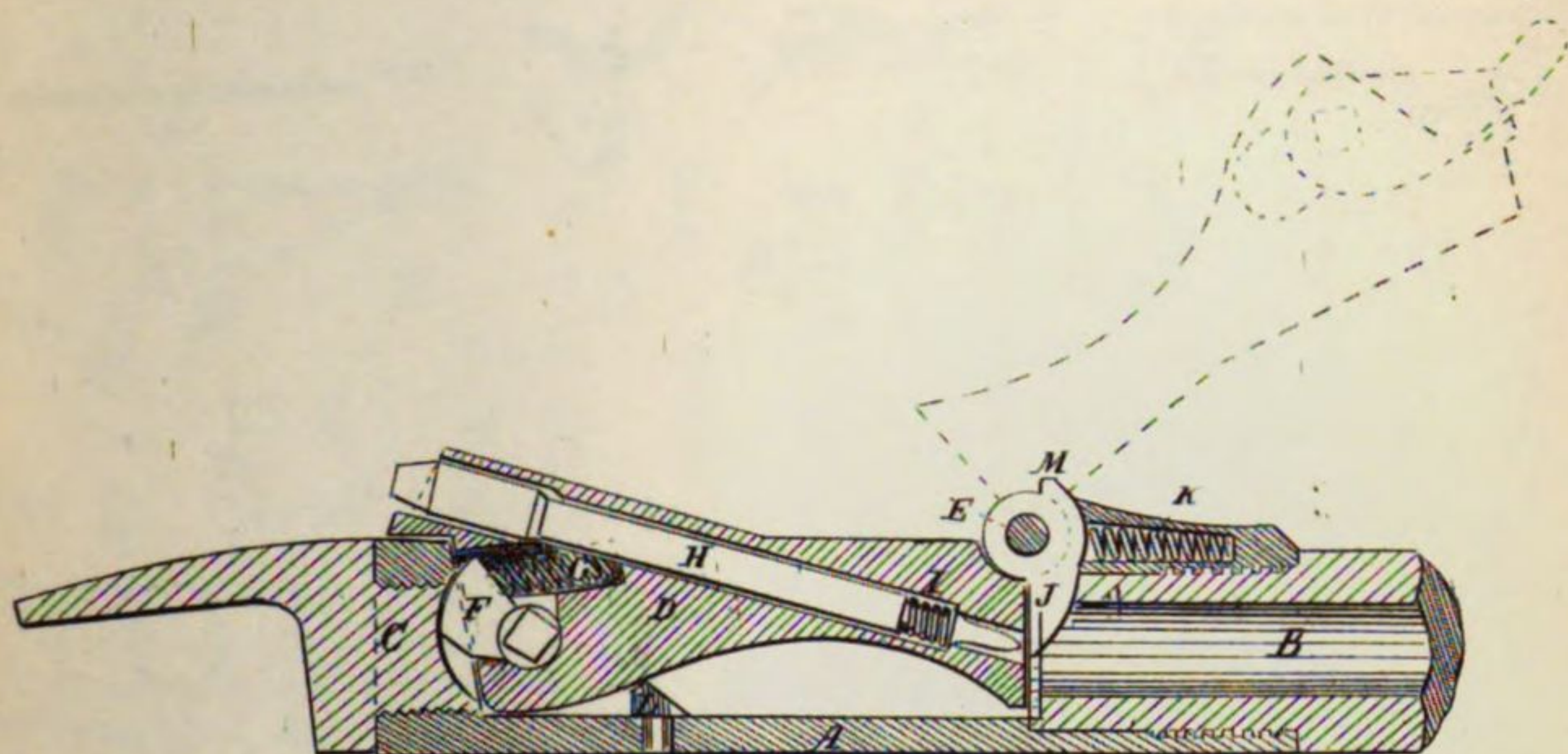
U.S. PATENT OFFICE, WASHINGTON, D.C.



TO BE KEPT BY THE PATENT OFFICE UNTIL THE PATENT HAS EXPIRED, AND THEN TO BE KEPT BY THE SECRETARY OF WAR.

PARTS NOT LISTED IN THE PATENT OFFICE RECORDS	
1. Receiver	2. Barrel
3. Stock	4. Bolt
5. Trigger	6. Magazine
7. Sight	8. Trigger Guard
9. Magazine Box	10. Trigger Spring
11. Trigger Pin	12. Trigger Pin Spring
13. Trigger Pin Spring	14. Trigger Pin Spring
15. Trigger Pin Spring	16. Trigger Pin Spring
17. Trigger Pin Spring	18. Trigger Pin Spring
19. Trigger Pin Spring	20. Trigger Pin Spring
21. Trigger Pin Spring	22. Trigger Pin Spring
23. Trigger Pin Spring	24. Trigger Pin Spring
25. Trigger Pin Spring	26. Trigger Pin Spring
27. Trigger Pin Spring	28. Trigger Pin Spring
29. Trigger Pin Spring	30. Trigger Pin Spring
31. Trigger Pin Spring	32. Trigger Pin Spring
33. Trigger Pin Spring	34. Trigger Pin Spring
35. Trigger Pin Spring	36. Trigger Pin Spring
37. Trigger Pin Spring	38. Trigger Pin Spring
39. Trigger Pin Spring	40. Trigger Pin Spring
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63. Trigger Pin Spring	64. Trigger Pin Spring
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67. Trigger Pin Spring	68. Trigger Pin Spring
69. Trigger Pin Spring	70. Trigger Pin Spring
71. Trigger Pin Spring	72. Trigger Pin Spring
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75. Trigger Pin Spring	76. Trigger Pin Spring
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79. Trigger Pin Spring	80. Trigger Pin Spring
81. Trigger Pin Spring	82. Trigger Pin Spring
83. Trigger Pin Spring	84. Trigger Pin Spring
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89. Trigger Pin Spring	90. Trigger Pin Spring
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95. Trigger Pin Spring	96. Trigger Pin Spring
97. Trigger Pin Spring	98. Trigger Pin Spring
99. Trigger Pin Spring	100. Trigger Pin Spring

PARTS NOT LISTED IN THE PATENT OFFICE RECORDS	
1. Receiver	2. Barrel
3. Stock	4. Bolt
5. Trigger	6. Magazine
7. Sight	8. Trigger Guard
9. Magazine Box	10. Trigger Spring
11. Trigger Pin	12. Trigger Pin Spring
13. Trigger Pin Spring	14. Trigger Pin Spring
15. Trigger Pin Spring	16. Trigger Pin Spring
17. Trigger Pin Spring	18. Trigger Pin Spring
19. Trigger Pin Spring	20. Trigger Pin Spring
21. Trigger Pin Spring	22. Trigger Pin Spring
23. Trigger Pin Spring	24. Trigger Pin Spring
25. Trigger Pin Spring	26. Trigger Pin Spring
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41. Trigger Pin Spring	42. Trigger Pin Spring
43. Trigger Pin Spring	44. Trigger Pin Spring
45. Trigger Pin Spring	46. Trigger Pin Spring
47. Trigger Pin Spring	48. Trigger Pin Spring
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51. Trigger Pin Spring	52. Trigger Pin Spring
53. Trigger Pin Spring	54. Trigger Pin Spring
55. Trigger Pin Spring	56. Trigger Pin Spring
57. Trigger Pin Spring	58. Trigger Pin Spring
59. Trigger Pin Spring	60. Trigger Pin Spring
61. Trigger Pin Spring	62. Trigger Pin Spring
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69. Trigger Pin Spring	70. Trigger Pin Spring
71. Trigger Pin Spring	72. Trigger Pin Spring
73. Trigger Pin Spring	74. Trigger Pin Spring
75. Trigger Pin Spring	76. Trigger Pin Spring
77. Trigger Pin Spring	78. Trigger Pin Spring
79. Trigger Pin Spring	80. Trigger Pin Spring
81. Trigger Pin Spring	82. Trigger Pin Spring
83. Trigger Pin Spring	84. Trigger Pin Spring
85. Trigger Pin Spring	86. Trigger Pin Spring
87. Trigger Pin Spring	88. Trigger Pin Spring
89. Trigger Pin Spring	90. Trigger Pin Spring
91. Trigger Pin Spring	92. Trigger Pin Spring
93. Trigger Pin Spring	94. Trigger Pin Spring
95. Trigger Pin Spring	96. Trigger Pin Spring
97. Trigger Pin Spring	98. Trigger Pin Spring
99. Trigger Pin Spring	100. Trigger Pin Spring



No. 48.—SPRINGFIELD, MODEL 1870.

A. Receiver.
B. Barrel.
C. Breech Screw.
D. Breech Block.

E. Hinge Pin.
F. Cam Latch.
G. Cam Latch Spring.
H. Firing Pin.
M. Extractor Point.

I. Firing Pin Spring.
J. Extractor.
K. Ejector Spring.
L. Ejector Stud.

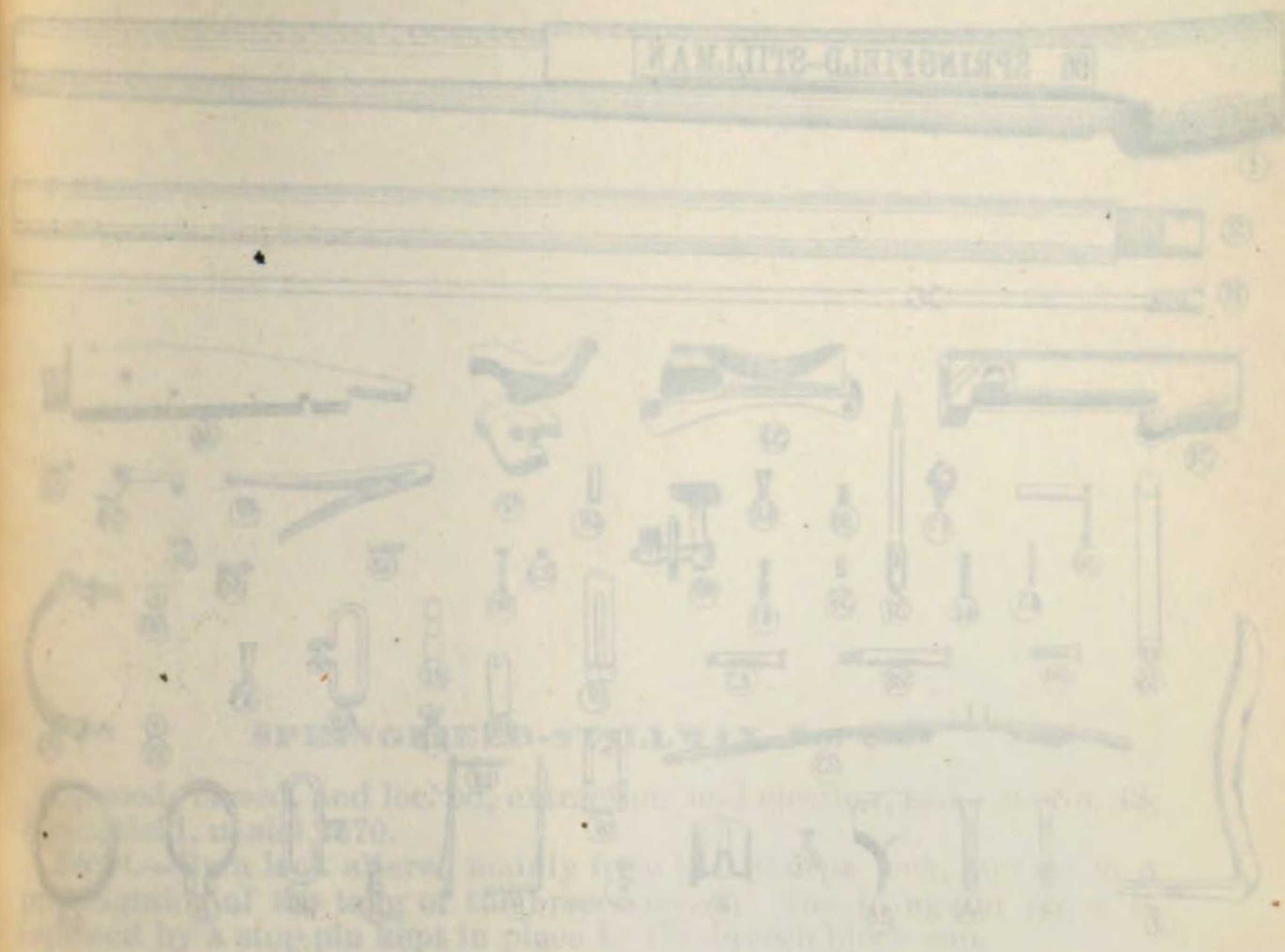


No. 48.—SPRINGFIELD, MODEL 1870.

I. Trigger pin spring.
 J. Extractor.
 K. Extractor spring.
 L. Extractor pin.

M. Extractor point.
 N. Trigger pin.
 O. Gun latch spring.
 P. Gun latch.

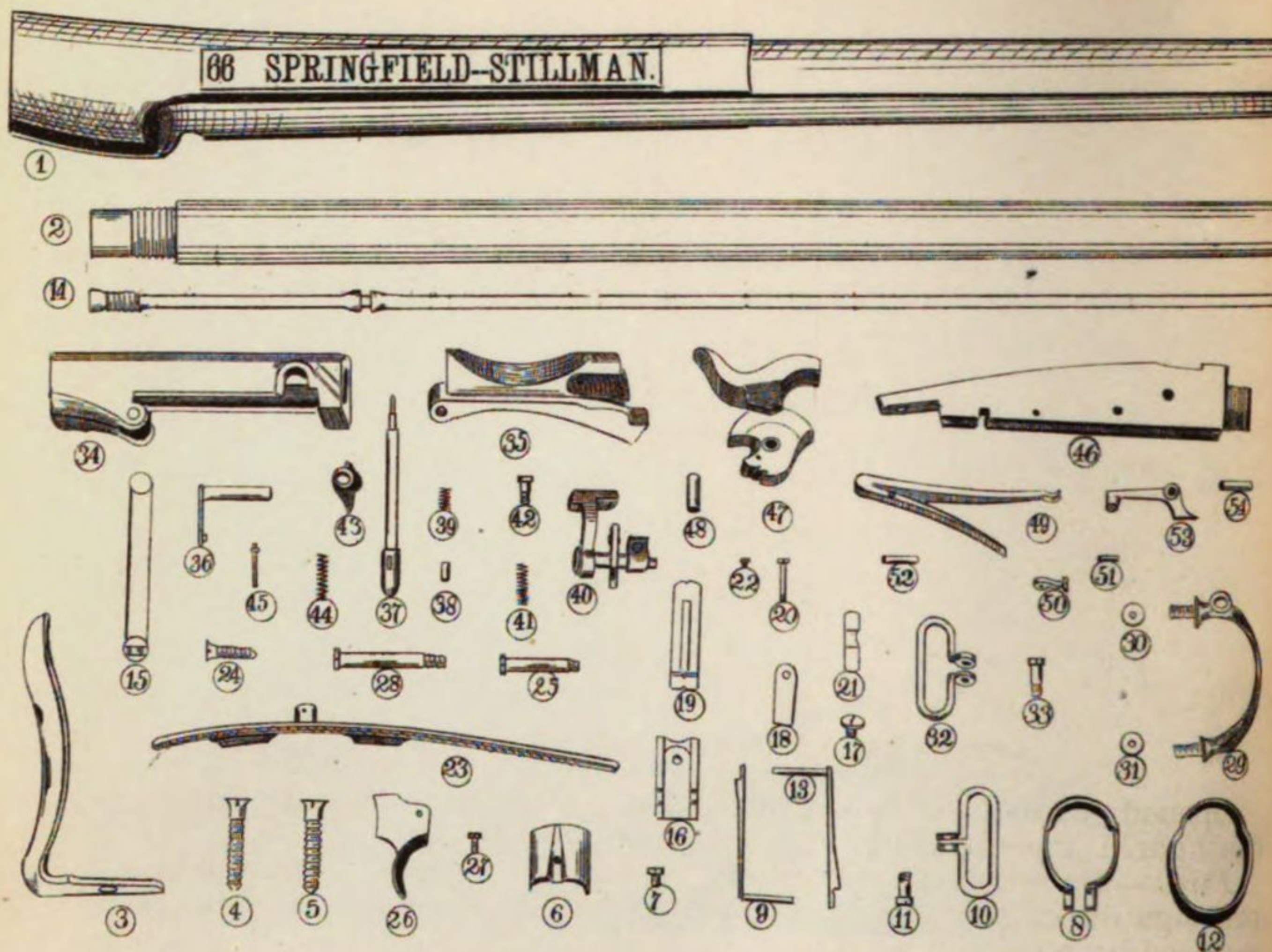
Q. Receiver.
 R. Barrel.
 S. Breach screw.
 T. Breach block.



21 PARTS LIST FOR THE RIFLE, OR COMMON TO ALL

Part No.	Description	Part No.	Description	Part No.	Description
1	Barrel	21	Receiver	31	Trigger
2	Receiver	22	Trigger	32	Trigger
3	Trigger	23	Trigger	33	Trigger
4	Trigger	24	Trigger	34	Trigger
5	Trigger	25	Trigger	35	Trigger
6	Trigger	26	Trigger	36	Trigger
7	Trigger	27	Trigger	37	Trigger
8	Trigger	28	Trigger	38	Trigger
9	Trigger	29	Trigger	39	Trigger
10	Trigger	30	Trigger	40	Trigger
11	Trigger	31	Trigger	41	Trigger
12	Trigger	32	Trigger	42	Trigger
13	Trigger	33	Trigger	43	Trigger
14	Trigger	34	Trigger	44	Trigger
15	Trigger	35	Trigger	45	Trigger
16	Trigger	36	Trigger	46	Trigger
17	Trigger	37	Trigger	47	Trigger
18	Trigger	38	Trigger	48	Trigger
19	Trigger	39	Trigger	49	Trigger
20	Trigger	40	Trigger	50	Trigger

SPRINGFIELD-STILLMAN, NO. 21



34 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood.

1 Stock.

FIFTEEN principal metallic parts not otherwise mentioned:

- 22 Guard Plate,
- 26 Trigger,
- 29 Guard Bow,
- 35 Breech Block,
- 37 Firing Pin,
- 40 Cam Latch,
- 40 Thumb Piece,
- 40 Breech Block Cap,
- 34 Receiver,
- 43 Extractor,

- 45 Ejector Spring Spindle,
- 46 Lock Frame and Breech Screw,
- 47 Hammer,
- 53 Sear,
- 50 Main Spring Swivel.

EIGHT Screws:

- 24 Guard Screw, Upper
- 25 Guard Screw, Lower
- 27 Trigger Screw,
- 30 Guard Bow Nut,
- 31 Guard Bow Nut,
- 42 Breech Block Cap Screw,
- 51 Main Spring Swivel Scr.,

28 Tang Screw.

FIVE Pins

- 38 Firing Pin Stop Pin,
- 36 Hinge Pin,
- 48 Hammer Pin,
- 52 Main Spring Stop Pin,
- 54 Sear Pin.

FOUR Springs:

- 39 Firing Pin Spring,
- 41 Cam Latch Spring,
- 44 Ejector Spring,
- 49 Main Spring.

ONE other minor part:

- 34 Ejector Stud.

24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 2 Barrel and Front Sight,
- 3 Butt Plate,
- 4 Butt Plate Screw,
- 5 Butt Plate Screw,
- 6 Tip,
- 7 Tip Screw,
- 8 Upper Band,
- 9 Upper Band Spring,

- 10 Upper Band Swivel,
- 11 Upper Band Swivel Scr.,
- 12 Lower Band,
- 13 Lower Band Spring,
- 14 Ramrod,
- 16 Rear Sight Base,
- 17 Rear Sight Base Screw,
- 18 Rear Sight Spring,

- 19 Rear Sight Leaf,
- 20 Rear Sight Joint Screw,
- 21 Rear Sight Leaf Slide,
- 22 Rear Sight Leaf Screw,
- 15 Ramrod Stop,
- 32 Guard Bow Swivel,
- 33 Guard Bow Swivel Scr.

SPRINGFIELD-STILLMAN, No. 66.

SPRINGFIELD-STILLMAN, No. 66.

Opened, closed, and locked, extraction and ejection, same as No. 48, Springfield, model 1870.

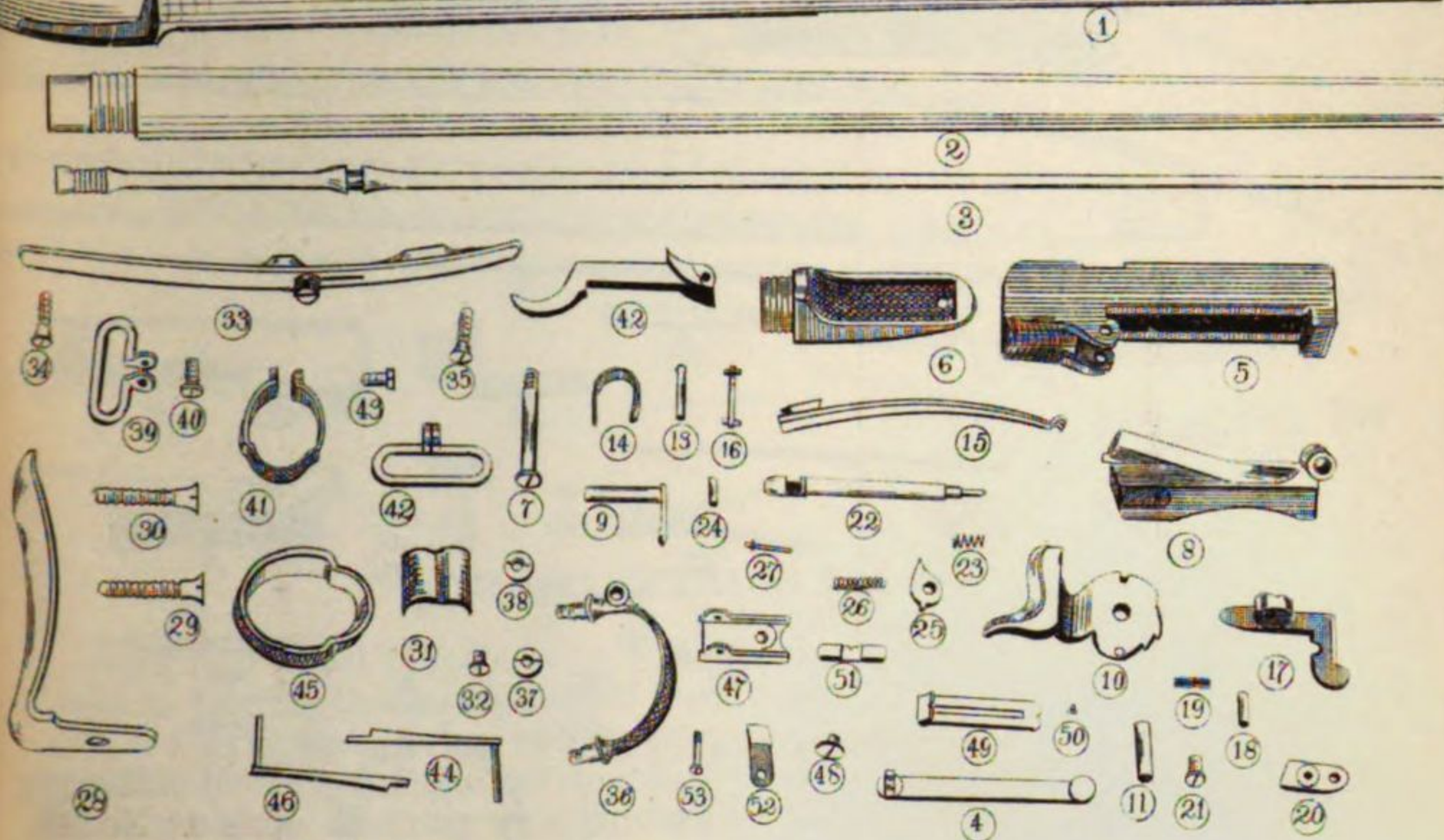
Fired.—By a lock altered mainly from the Sharps lock, and set in a prolongation of the tang of the breech-screw. The firing-pin screw is replaced by a stop-pin kept in place by the breech-block cap.

SPRINGFIELD-ALLIN, No. 68.

Opened, closed, and locked, extraction and ejection, same as No. 48, Springfield, model 1870, the cam-latch and thumb-piece being in one piece instead of being riveted together as in the service arm.

Fired.—By a center-lock, the mainspring of which lies under the receiver, being dovetailed into it at its forward end. The firing-pin screw is replaced by a stop-pin, which is kept in place by the breech-block cap.

68 SPRINGFIELD-ALLIN



32 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

THIRTEEN principal metallic parts not otherwise mentioned:

5 Receiver,
6 Lock Frame and Breech Screw,
8 Breech Block,
10 Hammer,
12 Trigger,
17 Cam Latch,
20 Breech Block Cap,
22 Firing Pin.
25 Extractor,

33 Guard Plate,
36 Guard Bow,
16 Main Spring Swivel,
27 Ejector Spring Spindle.

SIX Screws:

7 Tang Screw,
21 Breech Block Cap Screw,
34 Guard Screw,
35 Guard Screw,
37 Guard Bow Nut,
38 Guard Bow Nut.

FIVE Pins:

9 Hinge Pin,
11 Hammer Pin,

13 Trigger Pin,
18 Cam Latch Pin,
24 Firing Pin Stop Pin.

FIVE Springs:

14 Trigger Spring,
15 Main Spring,
19 Cam Latch Spring,
23 Firing Pin Spring,
26 Ejector Spring.

Two other minor parts:

9 Hinge Pin Stud,
5 Ejector Stud.

24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Barrel and Front Sight,
3 Ramrod,
28 Butt Plate,
29 Butt Plate Screw,
30 Butt Plate Screw,
31 Tip,
32 Tip Screw,
41 Upper Band,

42 Upper Band Swivel,
43 Upper Band Swivel Scr.,
44 Upper Band Spring,
45 Lower Band,
46 Lower Band Spring,
47 Rear Sight Base,
48 Rear Sight Base Screw,
49 Rear Sight Leaf,

50 Rear Sight Leaf Screw,
51 Rear Sight Leaf Slide,
52 Rear Sight Spring,
53 Rear Sight Joint Screw,
54 Ramrod Stop,
39 Guard Bow Swivel,
40 Guard Bow Swivel Screw.

SPRINGFIELD-ALLIN, No. 68.

SPRINGFIELD-ALLIN



...as shown in the drawings, and the details of the construction of the same are shown in the drawings. The drawings are intended to show the general construction of the same, and the details of the construction of the same are shown in the drawings. The drawings are intended to show the general construction of the same, and the details of the construction of the same are shown in the drawings.

22 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

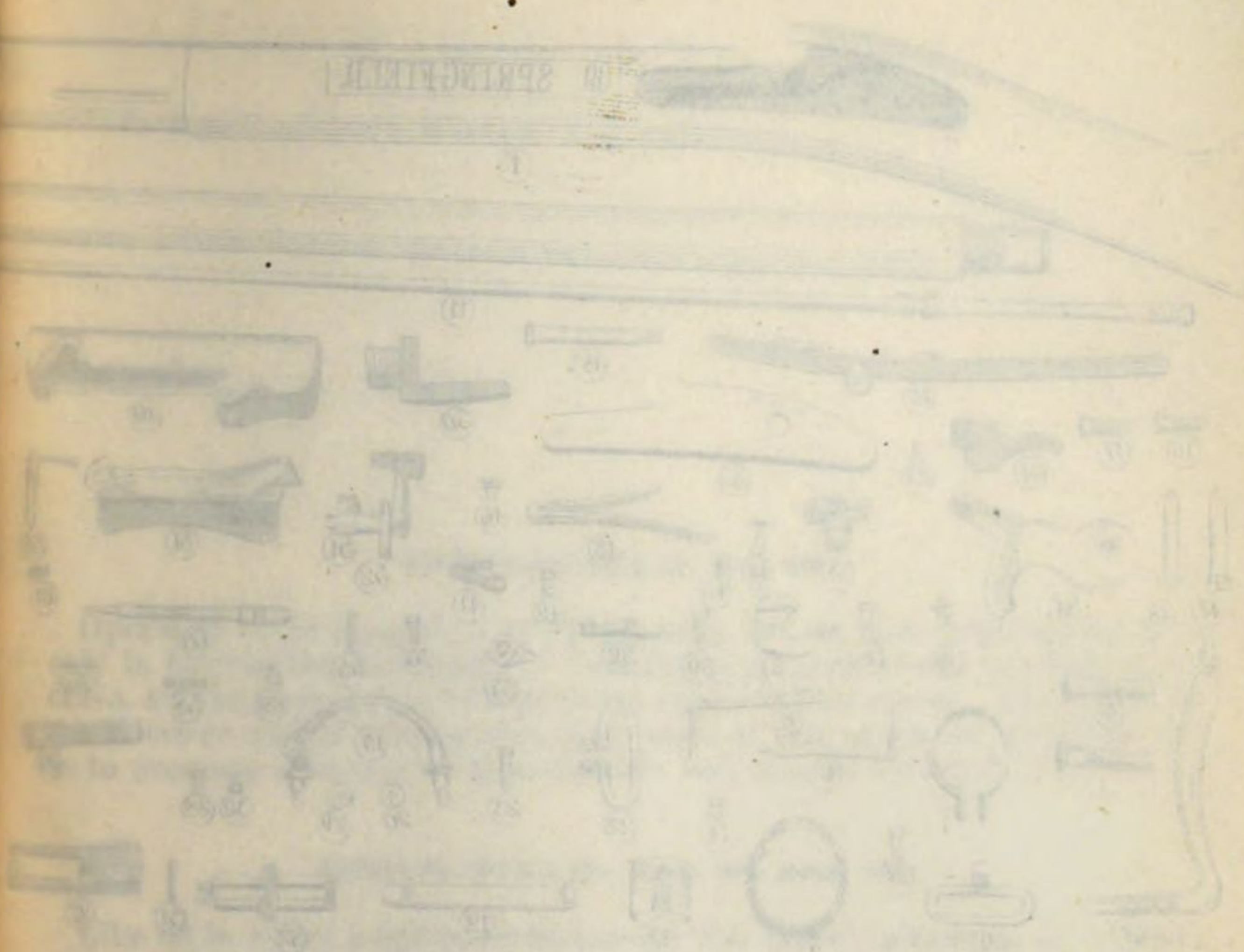
1	Block.	37	Guard Plate.
2	Block.	38	Guard Plate.
3	Block.	39	Guard Plate.
4	Block.	40	Guard Plate.
5	Block.	41	Guard Plate.
6	Block.	42	Guard Plate.
7	Block.	43	Guard Plate.
8	Block.	44	Guard Plate.
9	Block.	45	Guard Plate.
10	Block.	46	Guard Plate.
11	Block.	47	Guard Plate.
12	Block.	48	Guard Plate.
13	Block.	49	Guard Plate.
14	Block.	50	Guard Plate.
15	Block.	51	Guard Plate.
16	Block.	52	Guard Plate.
17	Block.	53	Guard Plate.
18	Block.	54	Guard Plate.
19	Block.	55	Guard Plate.
20	Block.	56	Guard Plate.
21	Block.	57	Guard Plate.
22	Block.	58	Guard Plate.
23	Block.	59	Guard Plate.
24	Block.	60	Guard Plate.
25	Block.	61	Guard Plate.
26	Block.	62	Guard Plate.
27	Block.	63	Guard Plate.
28	Block.	64	Guard Plate.
29	Block.	65	Guard Plate.
30	Block.	66	Guard Plate.
31	Block.	67	Guard Plate.
32	Block.	68	Guard Plate.
33	Block.	69	Guard Plate.
34	Block.	70	Guard Plate.
35	Block.	71	Guard Plate.
36	Block.	72	Guard Plate.
37	Block.	73	Guard Plate.
38	Block.	74	Guard Plate.
39	Block.	75	Guard Plate.
40	Block.	76	Guard Plate.
41	Block.	77	Guard Plate.
42	Block.	78	Guard Plate.
43	Block.	79	Guard Plate.
44	Block.	80	Guard Plate.
45	Block.	81	Guard Plate.
46	Block.	82	Guard Plate.
47	Block.	83	Guard Plate.
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54	Block.	90	Guard Plate.
55	Block.	91	Guard Plate.
56	Block.	92	Guard Plate.
57	Block.	93	Guard Plate.
58	Block.	94	Guard Plate.
59	Block.	95	Guard Plate.
60	Block.	96	Guard Plate.
61	Block.	97	Guard Plate.
62	Block.	98	Guard Plate.
63	Block.	99	Guard Plate.
64	Block.	100	Guard Plate.

24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

1	Block.	37	Guard Plate.
2	Block.	38	Guard Plate.
3	Block.	39	Guard Plate.
4	Block.	40	Guard Plate.
5	Block.	41	Guard Plate.
6	Block.	42	Guard Plate.
7	Block.	43	Guard Plate.
8	Block.	44	Guard Plate.
9	Block.	45	Guard Plate.
10	Block.	46	Guard Plate.
11	Block.	47	Guard Plate.
12	Block.	48	Guard Plate.
13	Block.	49	Guard Plate.
14	Block.	50	Guard Plate.
15	Block.	51	Guard Plate.
16	Block.	52	Guard Plate.
17	Block.	53	Guard Plate.
18	Block.	54	Guard Plate.
19	Block.	55	Guard Plate.
20	Block.	56	Guard Plate.
21	Block.	57	Guard Plate.
22	Block.	58	Guard Plate.
23	Block.	59	Guard Plate.
24	Block.	60	Guard Plate.
25	Block.	61	Guard Plate.
26	Block.	62	Guard Plate.
27	Block.	63	Guard Plate.
28	Block.	64	Guard Plate.
29	Block.	65	Guard Plate.
30	Block.	66	Guard Plate.
31	Block.	67	Guard Plate.
32	Block.	68	Guard Plate.
33	Block.	69	Guard Plate.
34	Block.	70	Guard Plate.
35	Block.	71	Guard Plate.
36	Block.	72	Guard Plate.
37	Block.	73	Guard Plate.
38	Block.	74	Guard Plate.
39	Block.	75	Guard Plate.
40	Block.	76	Guard Plate.
41	Block.	77	Guard Plate.
42	Block.	78	Guard Plate.
43	Block.	79	Guard Plate.
44	Block.	80	Guard Plate.
45	Block.	81	Guard Plate.
46	Block.	82	Guard Plate.
47	Block.	83	Guard Plate.
48	Block.	84	Guard Plate.
49	Block.	85	Guard Plate.
50	Block.	86	Guard Plate.
51	Block.	87	Guard Plate.
52	Block.	88	Guard Plate.
53	Block.	89	Guard Plate.
54	Block.	90	Guard Plate.
55	Block.	91	Guard Plate.
56	Block.	92	Guard Plate.
57	Block.	93	Guard Plate.
58	Block.	94	Guard Plate.
59	Block.	95	Guard Plate.
60	Block.	96	Guard Plate.
61	Block.	97	Guard Plate.
62	Block.	98	Guard Plate.
63	Block.	99	Guard Plate.
64	Block.	100	Guard Plate.

SPRINGFIELD-ALLIN, No. 22

SPRINGFIELD



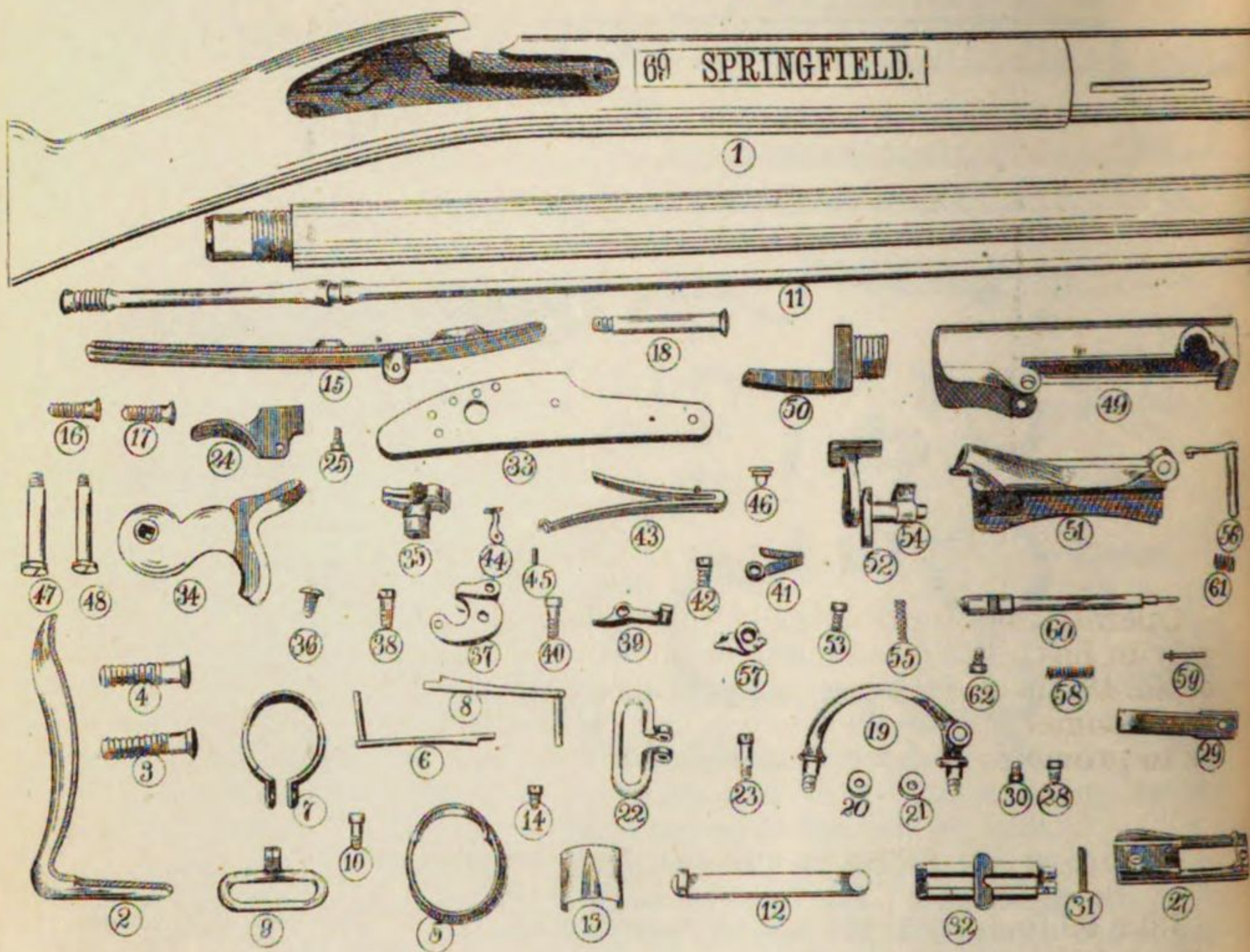
12 PARTS PRELIMINARY AND ESSENTIAL TO THE SYSTEM.

1. Spring Pin Screw	21. Receiver	41. Spring Pin	61. Spring Pin
2. Spring Pin	22. Spring Pin	42. Spring Pin	62. Spring Pin
3. Spring Pin	23. Spring Pin	43. Spring Pin	63. Spring Pin
4. Spring Pin	24. Spring Pin	44. Spring Pin	64. Spring Pin
5. Spring Pin	25. Spring Pin	45. Spring Pin	65. Spring Pin
6. Spring Pin	26. Spring Pin	46. Spring Pin	66. Spring Pin
7. Spring Pin	27. Spring Pin	47. Spring Pin	67. Spring Pin
8. Spring Pin	28. Spring Pin	48. Spring Pin	68. Spring Pin
9. Spring Pin	29. Spring Pin	49. Spring Pin	69. Spring Pin
10. Spring Pin	30. Spring Pin	50. Spring Pin	70. Spring Pin
11. Spring Pin	31. Spring Pin	51. Spring Pin	71. Spring Pin
12. Spring Pin	32. Spring Pin	52. Spring Pin	72. Spring Pin
13. Spring Pin	33. Spring Pin	53. Spring Pin	73. Spring Pin
14. Spring Pin	34. Spring Pin	54. Spring Pin	74. Spring Pin
15. Spring Pin	35. Spring Pin	55. Spring Pin	75. Spring Pin
16. Spring Pin	36. Spring Pin	56. Spring Pin	76. Spring Pin
17. Spring Pin	37. Spring Pin	57. Spring Pin	77. Spring Pin
18. Spring Pin	38. Spring Pin	58. Spring Pin	78. Spring Pin
19. Spring Pin	39. Spring Pin	59. Spring Pin	79. Spring Pin
20. Spring Pin	40. Spring Pin	60. Spring Pin	80. Spring Pin

28 PARTS NOT PRELIMINARY TO THE SYSTEM OR COMMON TO ALL ARMS.

1. Spring Pin	21. Receiver	41. Spring Pin	61. Spring Pin
2. Spring Pin	22. Spring Pin	42. Spring Pin	62. Spring Pin
3. Spring Pin	23. Spring Pin	43. Spring Pin	63. Spring Pin
4. Spring Pin	24. Spring Pin	44. Spring Pin	64. Spring Pin
5. Spring Pin	25. Spring Pin	45. Spring Pin	65. Spring Pin
6. Spring Pin	26. Spring Pin	46. Spring Pin	66. Spring Pin
7. Spring Pin	27. Spring Pin	47. Spring Pin	67. Spring Pin
8. Spring Pin	28. Spring Pin	48. Spring Pin	68. Spring Pin
9. Spring Pin	29. Spring Pin	49. Spring Pin	69. Spring Pin
10. Spring Pin	30. Spring Pin	50. Spring Pin	70. Spring Pin
11. Spring Pin	31. Spring Pin	51. Spring Pin	71. Spring Pin
12. Spring Pin	32. Spring Pin	52. Spring Pin	72. Spring Pin
13. Spring Pin	33. Spring Pin	53. Spring Pin	73. Spring Pin
14. Spring Pin	34. Spring Pin	54. Spring Pin	74. Spring Pin
15. Spring Pin	35. Spring Pin	55. Spring Pin	75. Spring Pin
16. Spring Pin	36. Spring Pin	56. Spring Pin	76. Spring Pin
17. Spring Pin	37. Spring Pin	57. Spring Pin	77. Spring Pin
18. Spring Pin	38. Spring Pin	58. Spring Pin	78. Spring Pin
19. Spring Pin	39. Spring Pin	59. Spring Pin	79. Spring Pin
20. Spring Pin	40. Spring Pin	60. Spring Pin	80. Spring Pin

SPRINGFIELD NO. 1



45 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

EIGHTEEN principal metallic parts not otherwise mentioned:

15 Guard Plate,
19 Guard Bow,
24 Trigger,
33 Lock Plate,
34 Hammer,
35 Tumbler,
37 Bridge,
39 Sear,
51 Breech Block,
52 Breech Block Cap,
54 Cam Latch,
60 Firing Pin,
49 Receiver,
50 Breech Screw,

57 Extractor,
44 Main Spring Swivel,
54 Thumb Piece,
59 Ejector Spring Spindle.

FIFTEEN Screws:

16 Guard Screw,
17 Guard Screw,
20 Guard Bow Nut,
21 Guard Bow Nut,
25 Trigger Screw,
36 Tumbler Screw,
38 Bridge Screw,
40 Sear Screw,
42 Sear Spring Screw,
46 Main Spring Scr'w Bolster,
47 Side Screw,
48 Side Screw,
53 Breech Block Cap Screw,

62 Firing Pin Screw,
18 Tang Screw.

TWO Pins:

45 Main Spring Swivel Pin,
56 Hinge Pin.

FIVE Springs:

41 Sear Spring,
43 Main Spring,
55 Cam Latch Spring,
61 Firing Pin Spring,
58 Ejector Spring.

FOUR other minor parts:

49 Ejector Stud,
56 Hinge Pin Stud,
1 Side Screw Washer,
1 Side Screw Washer.

26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Butt Plate,
3 Butt Plate Screw,
4 Butt Plate Screw,
5 Lower Band,
6 Lower Band Spring,
7 Upper Band,
9 Upper Band Swivel,
10 Upper Band Swivel Ser.,

8 Upper Band Spring,
11 Ramrod,
13 Tip,
14 Tip Screw,
26 Barrel and Front Sight,
27 Rear Sight Base,
28 Rear Sight Base Screw,
29 Rear Sight Spring,

30 Rear Sight Spring Screw,
31 Rear Sight Joint Screw,
32 Rear Sight Leaf, Cap and two Rivets,
12 Ramrod Stop,
22 Guard Bow Swivel,
23 Guard Bow Swivel Screw.

SPRINGFIELD, No. 69.

SPRINGFIELD, No. 69.

Operated in all respects like Springfield, No. 48, and differing from it only in having the lock-plate of uniform thickness, about one half that of No. 48, the mainspring bolster being replaced by a screw. The shape of the hammer and of the surrounding parts of the stock are changed, so as to promote economy of manufacture and ease of manipulation.

SPRINGFIELD, Nos. 88 and 99.

Like 69 in every respect, except as to the barrel, which is of caliber .45, and the other parts changed as a consequence of this alteration.

In No. 99 also the shape of the ejector-stud is modified, and a lining inserted into the receiver, with the intention of facilitating the introduction of the cartridges.

RUSSIAN-BERDAN, No. 57.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—By drawing back the locking-bolt to its full extent, thereby cocking the piece, and then throwing the breech-block upward and forward by the handle on its side.

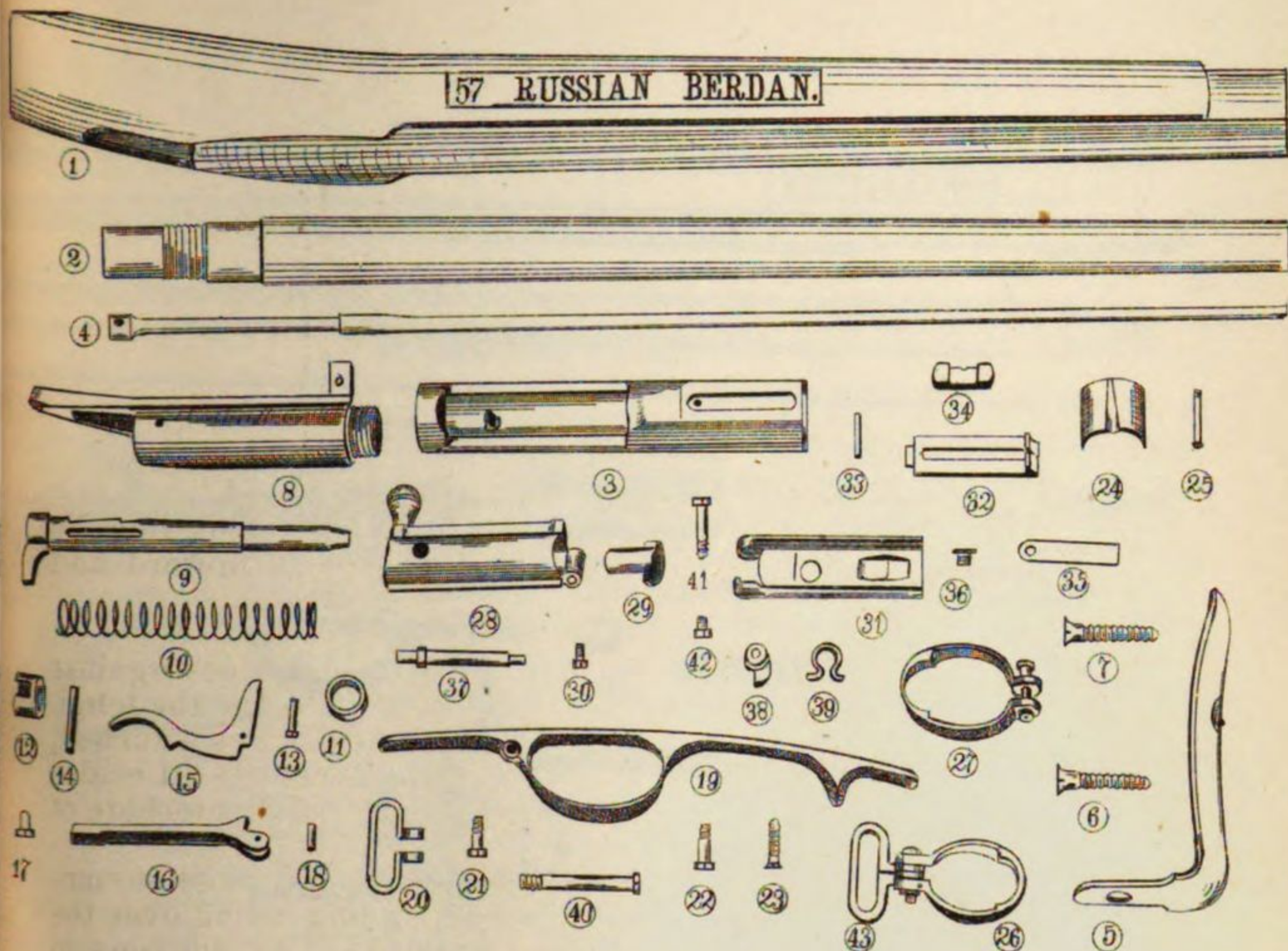
Closed.—By shutting the breech-block.

Locked.—By the friction of the rear face of the breech-block against the recoil-shoulder on the locking-bolt guide, against which the longitudinal motion of the hinge-strap slide, to which the block is attached, allows it bodily to slide under the influence of the discharge. It is also held in place by the entrance of the locking-bolt into the counterbore of the firing-pin hole when the piece is fired.

Fired.—In drawing back the locking-bolt to open the piece it compresses the spiral mainspring which surrounds it, and riding over the point of the spring-sear is caught by it and retained against the tension of the mainspring when the support of the hand is withdrawn. When released through the trigger in the usual way it is impelled against the firing-pin, and so discharges the piece.

Extraction.—By an extractor swinging on the joint-screw and struck above its center of motion by the forward end of the breech-block near the completion of its movement in opening.

Ejection.—By accelerating the movement of the extractor by the ejector-spring, one end of which has a solid bearing on the hinge-strap slide, and the other resting on the extractor above the center of motion, causes the spring to be compressed by the movement of the latter, until the direction of the resistance passes below the center of motion; the sudden release of the spring then throws out the extractor, carrying with it the shell, which in passing out is deflected by the beveled surface of the ejector-stud, and is thus thrown clear of the piece.



27 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

TEN principal metallic parts
not otherwise mentioned:

- 3 Receiver,
- 9 Locking Bolt,
- 8 Locking Bolt Guide,
- 28 Breech Block,
- 29 Breech Block Section,
- 37 Firing Pin,
- 38 Extractor,
- 31 Hinge Strap Slide,
- 19 Guard Plate,

15 Trigger.

SEVEN Screws:

- 30 Br'ch Block Section Ser.,
- 41 Breech Block Joint Ser.,
- 42 Breech Block Joint Screw Nut,
- 22 Guard Plate Ser., Upper
- 23 Guard Plate Ser., Lower
- 17 Spring Sear Screw,
- 40 Tang Screw.

THREE Pins:

- 13 Main Spring Upper Stop Washer Pin,

- 14 Main Spring Lower Stop Washer Pin,
- 18 Trigger Pin.

THREE Springs:

- 16 Spring Sear,
- 10 Main Spring,
- 39 Ejector Spring.

THREE other minor parts:

- 3 Ejector Stud,
- 11 Main Spring Stop Washer, Upper,
- 12 Main Spring Stop Washer, Lower.

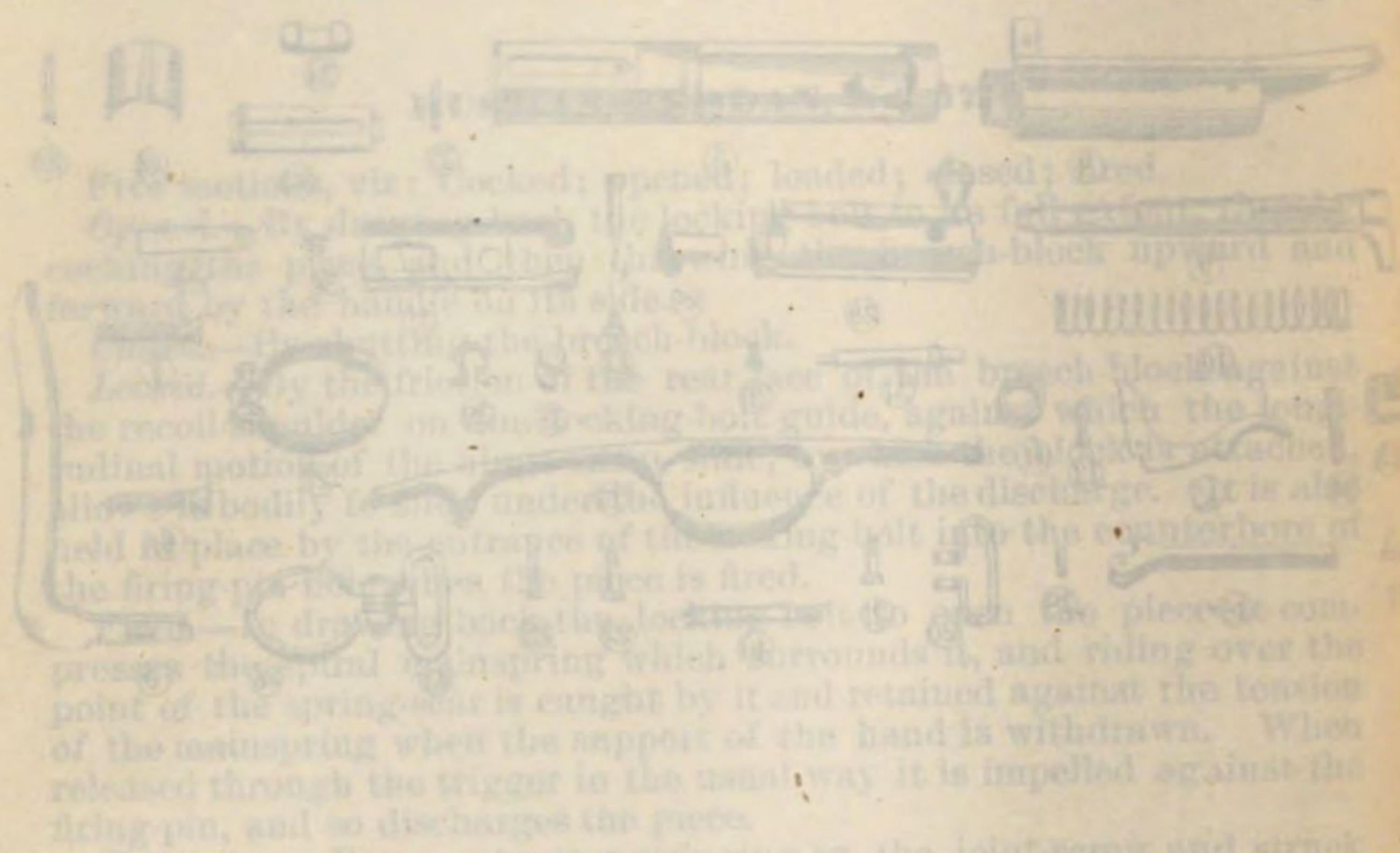
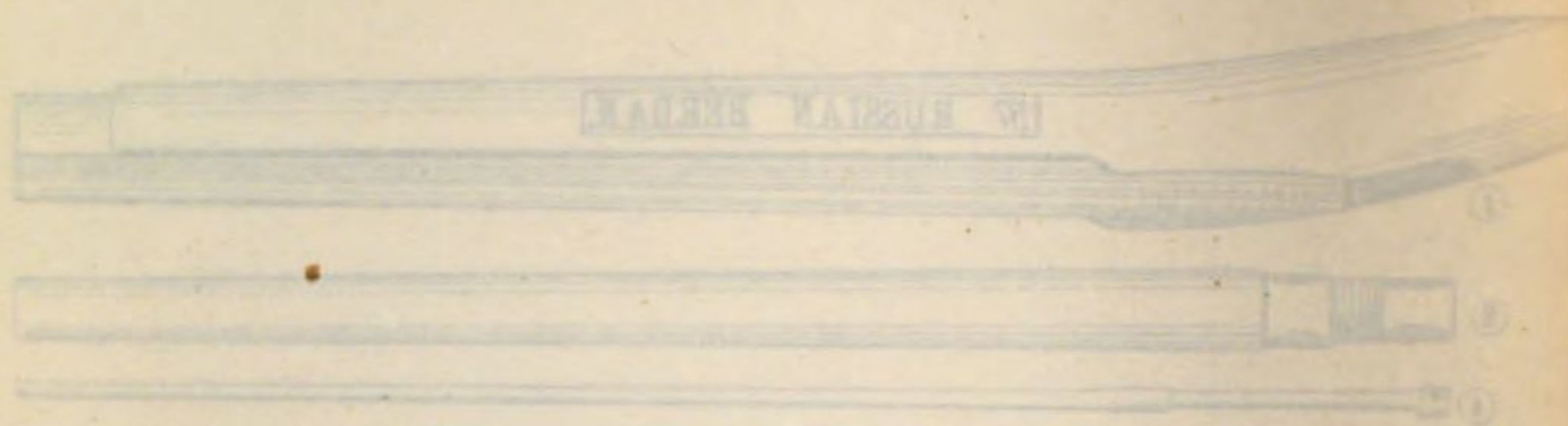
24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 2 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 24 Tip,
- 25 Tip Screw,

- 26 Upper Band, Band Screw, and Washer,
- 27 Lower Band, Band Screw, and Washer,
- 43 Band Swivel,
- 34 Rear Sight Slide,
- 33 Rear Sight Joint Pin,

- 35 Rear Sight Spring,
- 36 Rear Sight Spring Screw,
- 1 Two Band Pins,
- 32 Rear Sight Leaf,
- 20 Guard Plate Swivel,
- 21 Guard Plate Swivel Scr.

RUSSIAN-BERDAN, No. 57.

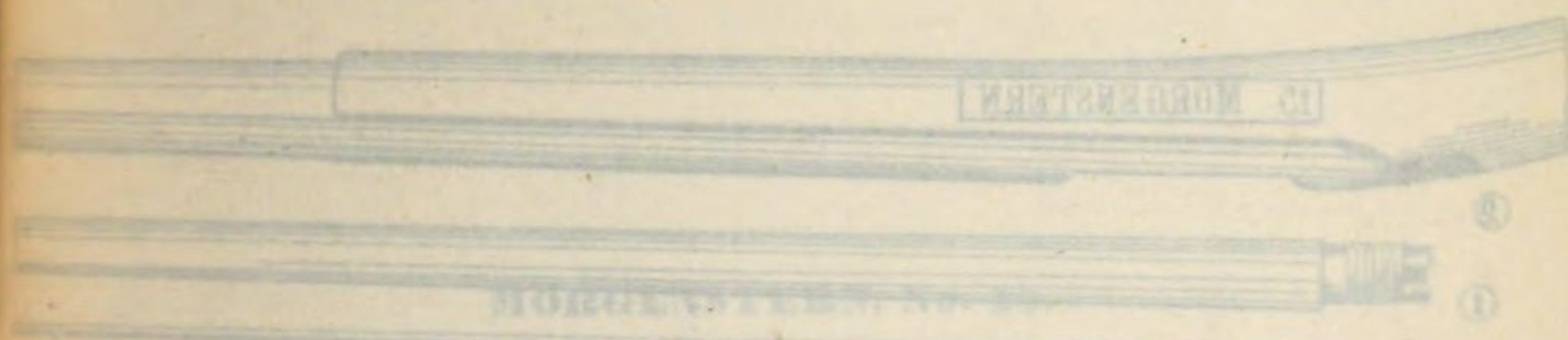


EXTRACTION OF THE CARTRIDGE FROM THE CHAMBER OF THE RIFLE.

The bolt is drawn back by the trigger, and the cartridge is pushed forward by the spring. The bullet is then fired, and the spent casing is ejected.

1	Upper Band, Band Screw,	20	Lower Band, Band Screw,
2	and Washer,	21	and Washer,
3	Two Band Pins,	22	Band Pin,
4	Band Pin,	23	Band Pin,
5	Band Pin,	24	Band Pin,
6	Band Pin,	25	Band Pin,
7	Band Pin,	26	Band Pin,
8	Band Pin,	27	Band Pin,
9	Band Pin,	28	Band Pin,
10	Band Pin,	29	Band Pin,
11	Band Pin,	30	Band Pin,
12	Band Pin,	31	Band Pin,
13	Band Pin,	32	Band Pin,
14	Band Pin,	33	Band Pin,
15	Band Pin,	34	Band Pin,
16	Band Pin,	35	Band Pin,
17	Band Pin,	36	Band Pin,
18	Band Pin,	37	Band Pin,
19	Band Pin,	38	Band Pin,

RIFLE BARREL, No. 1.



Four motions, viz: Opened; loaded; locked; fired.

Opened.—By drawing back the handle of the firing bolt until it is stopped by the rear of the receiver. The handle of the firing bolt is then turned forward, and the bolt is pushed forward by the action of the spring, and the bolt is locked. The handle of the firing bolt is then turned forward, and the bolt is pushed forward by the action of the spring, and the bolt is locked.

Loaded.—By reversing the motion of the handle of the firing bolt, the bolt is pushed back, and the cartridge is pushed forward by the action of the spring, and the bolt is locked.

Locked.—By the action of the handle of the firing bolt, the bolt is pushed forward, and the cartridge is pushed forward by the action of the spring, and the bolt is locked.

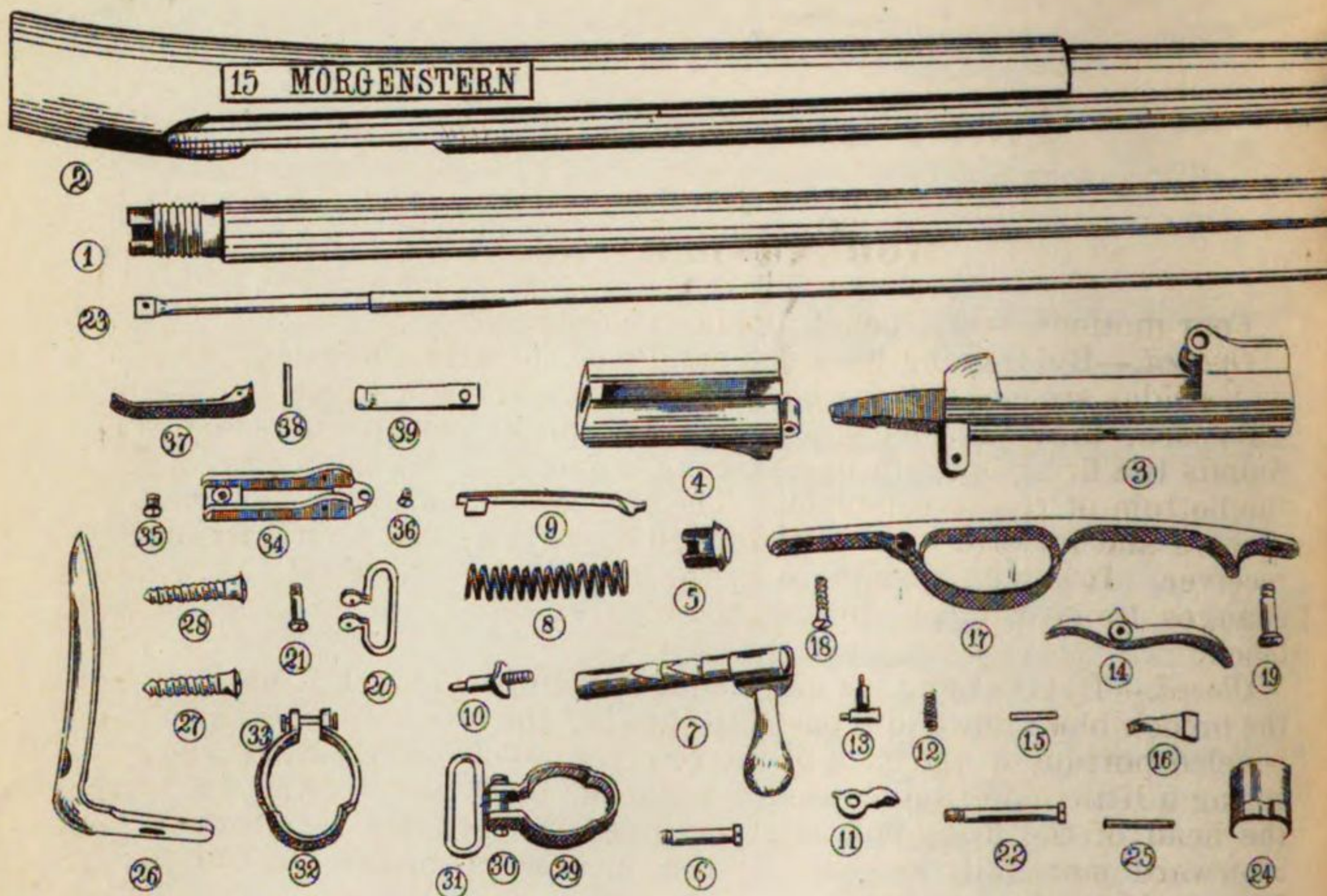
Fired.—By the action of the handle of the firing bolt, the bolt is pushed forward, and the cartridge is pushed forward by the action of the spring, and the bolt is locked.

Retraction.—By the action of the handle of the firing bolt, the bolt is pushed back, and the cartridge is pushed forward by the action of the spring, and the bolt is locked.

Operation.—By the action of the handle of the firing bolt, the bolt is pushed forward, and the cartridge is pushed forward by the action of the spring, and the bolt is locked.

PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL.		PARTS PECULIAR TO THE SYSTEM, OR COMMON TO ALL.	
1	Barrel and Front Sight.	20	Upper Band.
2	Hammer.	21	Upper Band Screw & Nut.
3	Tip.	22	Upper Band Nut.
4	Tip Screw.	23	Lower Band.
5	Butt Plate.	24	Lower Band Screw and Nut.
6	Butt Plate Screw.	25	Butt Plate.
7	Butt Plate Screw.	26	Butt Plate Screw.
8	Butt Plate Screw.	27	Butt Plate Screw.
9	Butt Plate Screw.	28	Butt Plate Screw.
10	Butt Plate Screw.	29	Butt Plate Screw.
11	Butt Plate Screw.	30	Butt Plate Screw.
12	Butt Plate Screw.	31	Butt Plate Screw.
13	Butt Plate Screw.	32	Butt Plate Screw.
14	Butt Plate Screw.	33	Butt Plate Screw.
15	Butt Plate Screw.	34	Butt Plate Screw.
16	Butt Plate Screw.	35	Butt Plate Screw.
17	Butt Plate Screw.	36	Butt Plate Screw.
18	Butt Plate Screw.	37	Butt Plate Screw.
19	Butt Plate Screw.	38	Butt Plate Screw.

MONAGHAN, No. 12



20 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :		ONE Pin :	
2 Stock.		15 Trigger Pin.	
NINE principal metallic parts not otherwise mentioned :		FOUR Springs :	
4 Breech Block,	11 Extractor,	8 Main Spring,	
5 Section of Breech Block,	13 Ejector Spring Spindle,	9 Trigger Spring,	
7 Firing Bolt,	14 Trigger,	12 Ejector Spring,	
10 Firing Pin,	17 Guard.	16 Trigger Spring,	
3 Receiver,		ONE other minor part :	
	FOUR Screws :	13 Ejector Spring Roll.	
	6 Breech Block Hinge Ser.,		
	18 Guard Screw,		
	19 Guard Screw,		
	22 Tang Screw.		

23 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

1 Barrel and Front Sight,	29 Upper Band,	35 Rear Sight Base Screw.
23 Ramrod,	30 Upper Band Screw & Nut,	36 Rear Sight Base Screw.
24 Tip,	31 Upper Band Swivel,	37 Rear Sight Leaf.
25 Tip Screw,	32 Lower Band,	38 Rear Sight Joint Pin.
26 Butt Plate,	33 Lower Band Screw and Nut,	39 Rear Sight Spring.
27 Butt Plate Screw,	34 Rear Sight Base,	20 Guard Swivel.
28 Butt Plate Screw,		21 Guard Swivel Screw.

MORGANSTERN, No. 15.

MORGENSTERN, No. 15.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By drawing back the handle of the firing-bolt until the ribs on its sides are clear of the grooves in the receiver in which they slide. This cocks the piece by compressing the spiral mainspring which surrounds the firing-bolt, until it is caught and held by the sear lying in the bottom of the breech-block. The breech-block may be then thrown upward and forward until it is stopped by striking the front part of the receiver. It is held open there by the head of the ejector-spindle, which changes its bearing on the extractor so as, through it, to support the block.

Closed.—By reversing the movement of the breech-block. In shutting the breech-block down into place, the head of the firing-bolt rides over the beveled portion of the back of the receiver. This compresses the mainspring a little more, and causes it, when the block is well home, to draw the head of the firing-bolt slightly under the grooves by which it is afterward more fully locked. By this means the breech-block is kept from accidentally opening.

Locked.—By the side ribs of the firing-bolt engaging with the undercut grooves in the rear portion of the receiver.

Fired.—By a concealed spiral-spring lock, the firing-bolt being released by the action of the trigger within the receiver upon the sear within the block.

Extraction.—By the breech-block striking the lug on the extractor above its center of motion.

Ejection.—By the acceleration impressed on the extractor by the action of the ejector-spring on the ejector-spindle, when, by the motion of opening, the direction of this latter passes below the axis of the extractor. The ejector-spring is then released from the tension caused by its compression in opening, and causes the extractor to rapidly rotate about its axis, carrying the empty cartridge against the beveled shoulders of the receiver, by which it is deflected upward and thrown clear of the gun.

BROUGHTON, No. 79.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—By cocking the piece so as to withdraw the nose of the hammer from the counterbore of the firing-pin hole, and then pressing forward the latch-lever, which passes through firing-pin, until the head of the pin is disengaged from the corresponding cavity in the receiver and the breech-block is free to swing upward and forward over the barrel.

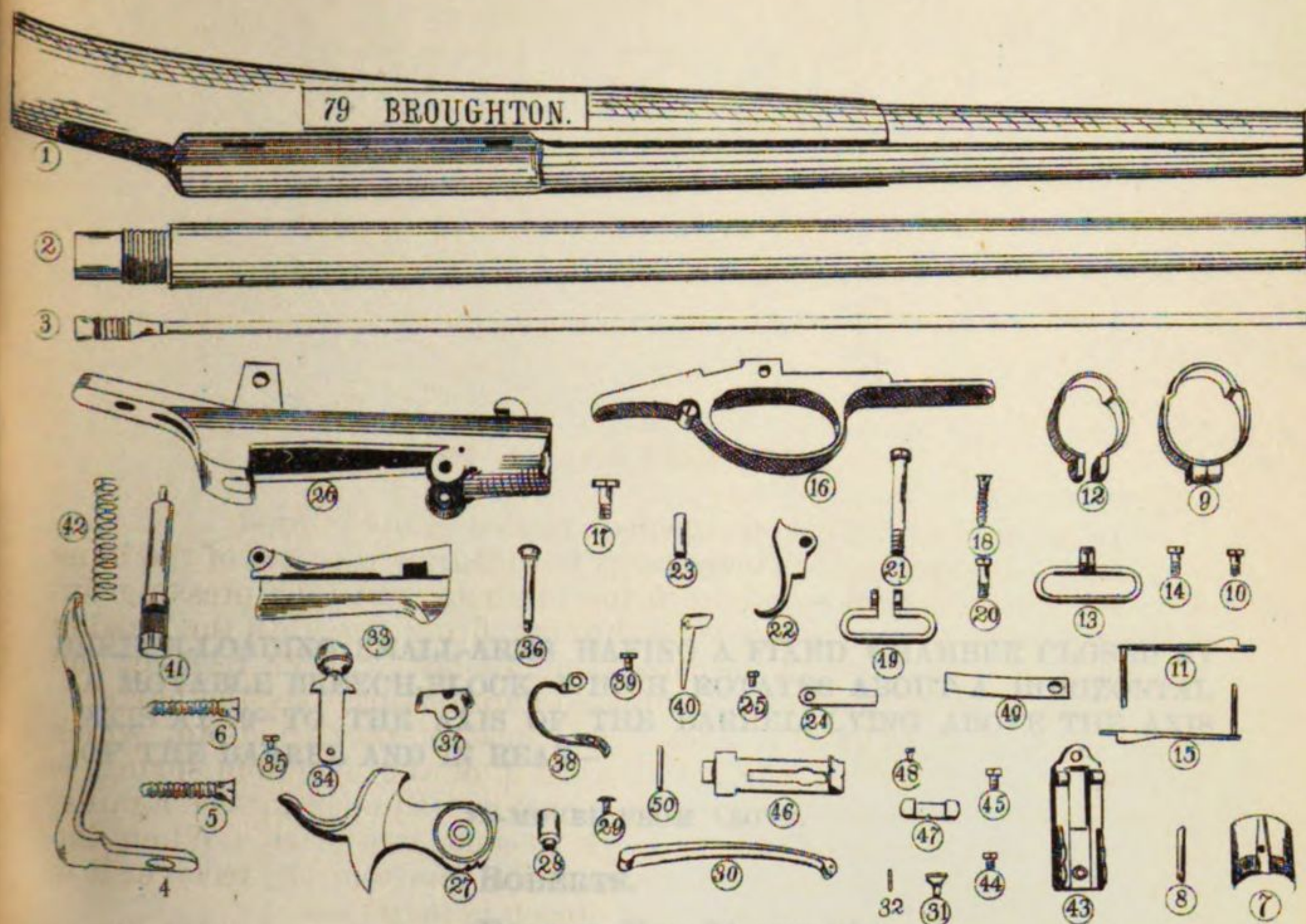
Closed.—By shutting the block. The head of the firing-pin, which projects to the rear from the action upon it of the firing-pin spring, is forced forward by the striking of the bevel on its under surface against the receiver, and thus allows the block to come into place. When the head of the firing-pin comes opposite to its cavity in the receiver it is driven into it by the spring, and the breech is thereby—

Locked.—It is still further held by the entrance of the nose of the hammer into the mouth of the firing-pin hole when the piece is fired.

Fired.—By the action of a mainspring articulated into the bottom of the receiver in front, and moving a central lock of the usual form.

Extraction.—By an extractor swinging on the hinge-pin outside of the frame and struck above its center of motion by the front end of the breech-block near the completion of its movement.

Ejection.—By the acceleration impressed on the extractor by a bow-spring lying outside the barrel, the direction of the pressure of which, after the shell has been loosened and partly withdrawn by the extractor, passes below the center of motion on the pin, and by quickening its motion, drives the shell backward, until by striking the beveled surface of the ejector-stud, it is thrown clear of the gun.



28 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood :

1 Stock.

TEN principal metallic parts not otherwise mentioned :

16 Guard,
22 Trigger,
26 Receiver,
27 Hammer,
31 Main Spring Swivel,
33 Breech Block,
34 Latch Lever,
37 Extractor,

40 Hinge Pin Stop,
41 Firing Pin.

NINE Screws :

17 Guard Screw, Upper
18 Guard Screw, Lower
21 Tang Screw,
23 Trigger Screw,
25 Trigger Spring Screw,
29 Hammer Pin Screw,
35 Br'ch Block Thumb Piece
Screw,
39 Ejector Spring Screw,

40 Hinge Pin Stop Screw!

THREE Pins :

28 Hammer Pin,
32 Main Spring Swivel Pin,
36 Hinge Pin.

FOUR Springs :

24 Trigger Spring,
30 Main Spring,
38 Ejector Spring,
42 Firing Pin Spring.

ONE other minor part :

26 Ejector Stud.

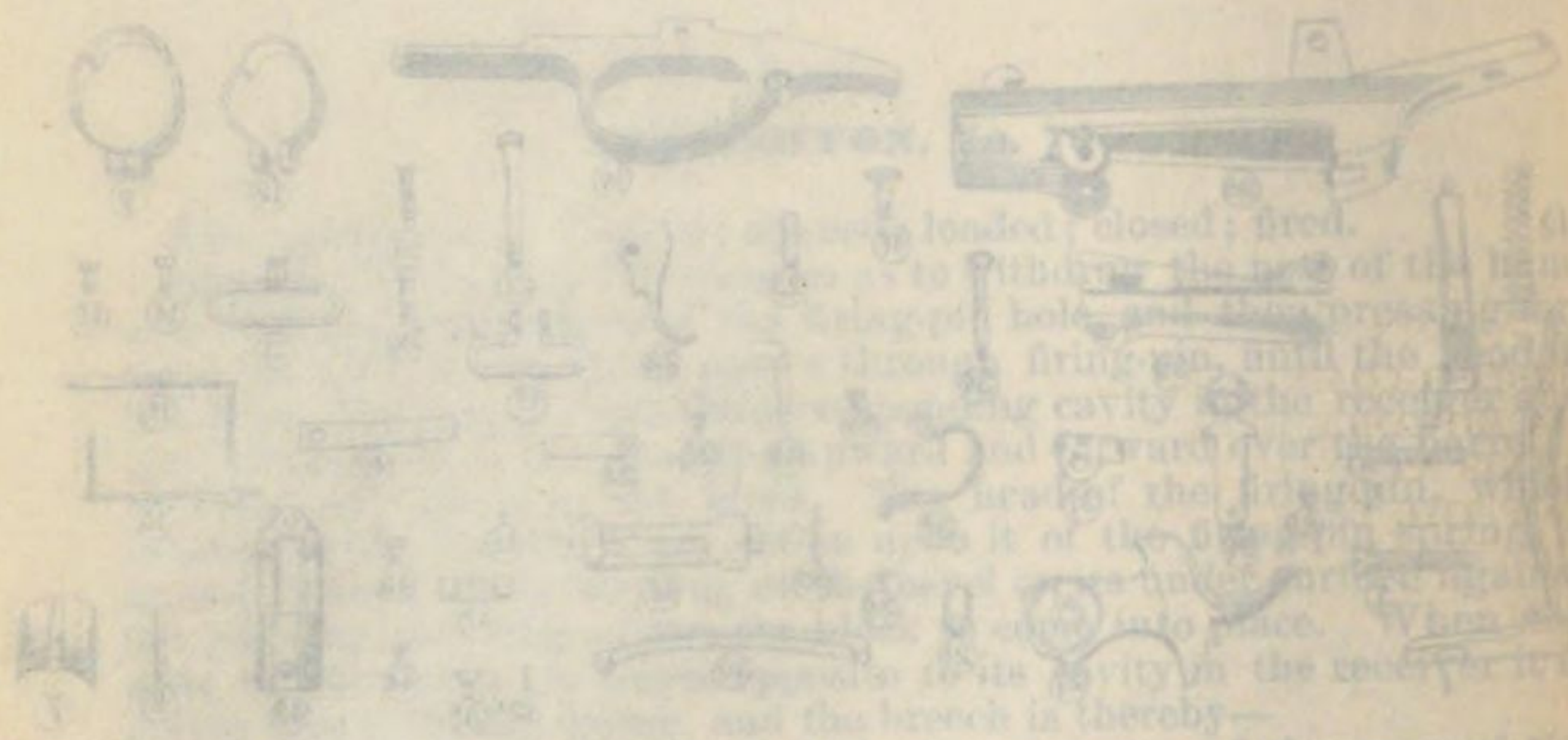
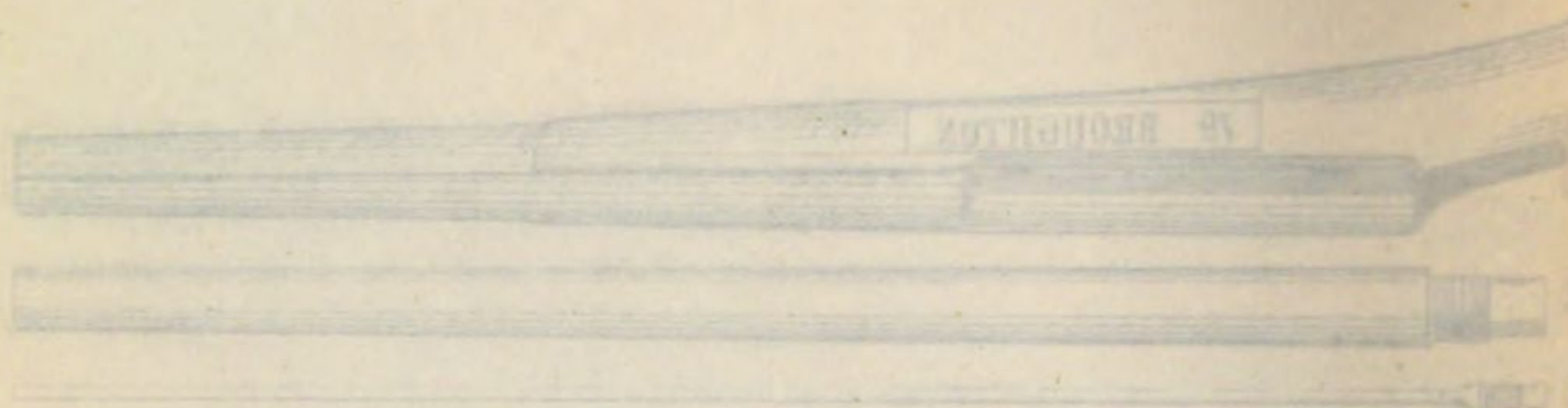
25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Barrel and Front Sight,
3 Ramrod,
4 Butt Plate,
5 Butt Plate Screw,
6 Butt Plate Screw,
7 Tip,
8 Tip Screw,
9 Lower Band,

10 Lower Band Screw,
11 Lower Band Spring,
12 Upper Band,
13 Upper Band Swivel,
14 Upper Band Screw,
15 Upper Band Spring,
19 Guard Swivel,
20 Guard Swivel Screw,

43 Rear Sight Base,
44 Rear Sight Base Screw,
45 Rear Sight Base Screw,
46 Rear Sight Leaf,
47 Rear Sight Leaf Slide,
48 Rear Sight Leaf Screw,
49 Rear Sight Spring,
50 Rear Sight Joint Pin.

BROUGHTON, No. 79.



- 40 Hinge pin stop screw
- 41 Hinge pin
- 42 Hinge pin
- 43 Hinge pin
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- 159 Hinge pin
- 160 Hinge pin

BROUGHTON, No. 2

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH ROTATES ABOUT A HORIZONTAL AXIS AT 90° TO THE AXIS OF THE BARREL, LYING ABOVE THE AXIS OF THE BARREL AND IN REAR—

1.—MOVED FROM ABOVE.

ROBERTS.

ELLIOT, Nos. 24 AND 80.

WERDER.

SMOOT.

LEE, No. 54.

LEE, No. 61.

ROBERTS, No. 64.

Four motions, viz: Opened; loaded; cocked; fired.

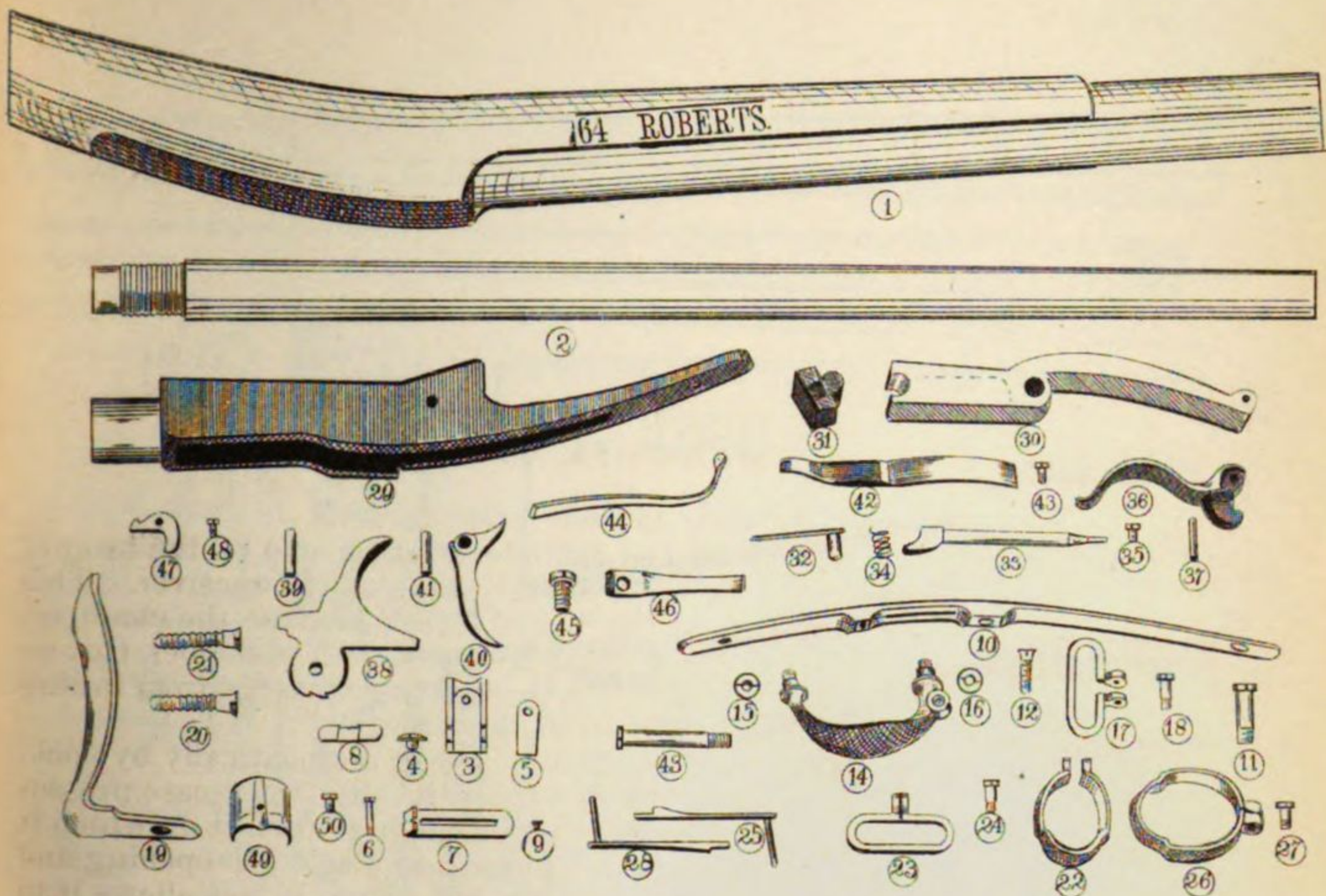
Opened.—By raising the hooked catch-lever at the end of the tang of the breech-block out of its notch in the tang of the receiver. This depresses the forward end of the block so as to expose the chamber. The reaction of the breech-block spring lying beneath the block throws up the front of the block sufficiently to keep the cartridge from falling out of the chamber before the breech is fully closed.

Closed.—By returning the lever to its place, or automatically by cocking the piece. The back of the hammer in the latter case presses against the end of the slot in the tang of the breech-block in which it plays, and so raises the front of the block into place. In opening and closing the piece the knuckle-joint of the breech-block face allows it to recede from and approach the face of the cartridge, so that it may support the cartridge more nearly at right angles to the axis of the bore than if the block were in one piece and its lower edge lay close to the barrel when shut.

Locked.—By the position of the breech-block, which is also kept in place by the engaging of the hook of the catch-lever with a corresponding notch in the tang of the receiver.

Fired.—By a center-lock of the usual pattern.

Extraction and ejection.—By a bent lever pivoted to the side of the receiver below the chamber, and struck by the breech-block face in its descent.



30 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

TEN principal metallic parts
not otherwise mentioned:

- 30 Breech Block,
- 31 Breech Block Face,
- 33 Firing Pin,
- 36 Catch Lever,
- 29 Receiver,
- 38 Hammer,
- 40 Trigger,
- 47 Extractor,
- 10 Guard Plate,
- 14 Guard Bow.

NINE Screws:

- 35 Firing Pin Screw,
- 43 Trigger and Breech Block
Spring Screw,
- 45 Main Spring Screw,
- 48 Extractor Screw,
- 11 Guard Screw, Upper
- 12 Guard Screw, Lower
- 15 Guard Bow Nut,
- 16 Guard Bow Nut,
- 13 Tang Screw.

FIVE Pins:

- 37 Catch Lever Pin,
- 32 Hinge Pin,

- 39 Hammer Pin,
- 41 Trigger Pin,
- 44 Main Spring Friction Roll
Pin.

FOUR Springs:

- 34 Firing Pin Spring,
- 42 Trigger and Breech Block
Spring,
- 44 Main Spring,
- 46 Catch Lever Spring.

ONE other minor part:

- 44 Main Spring Friction Roll.

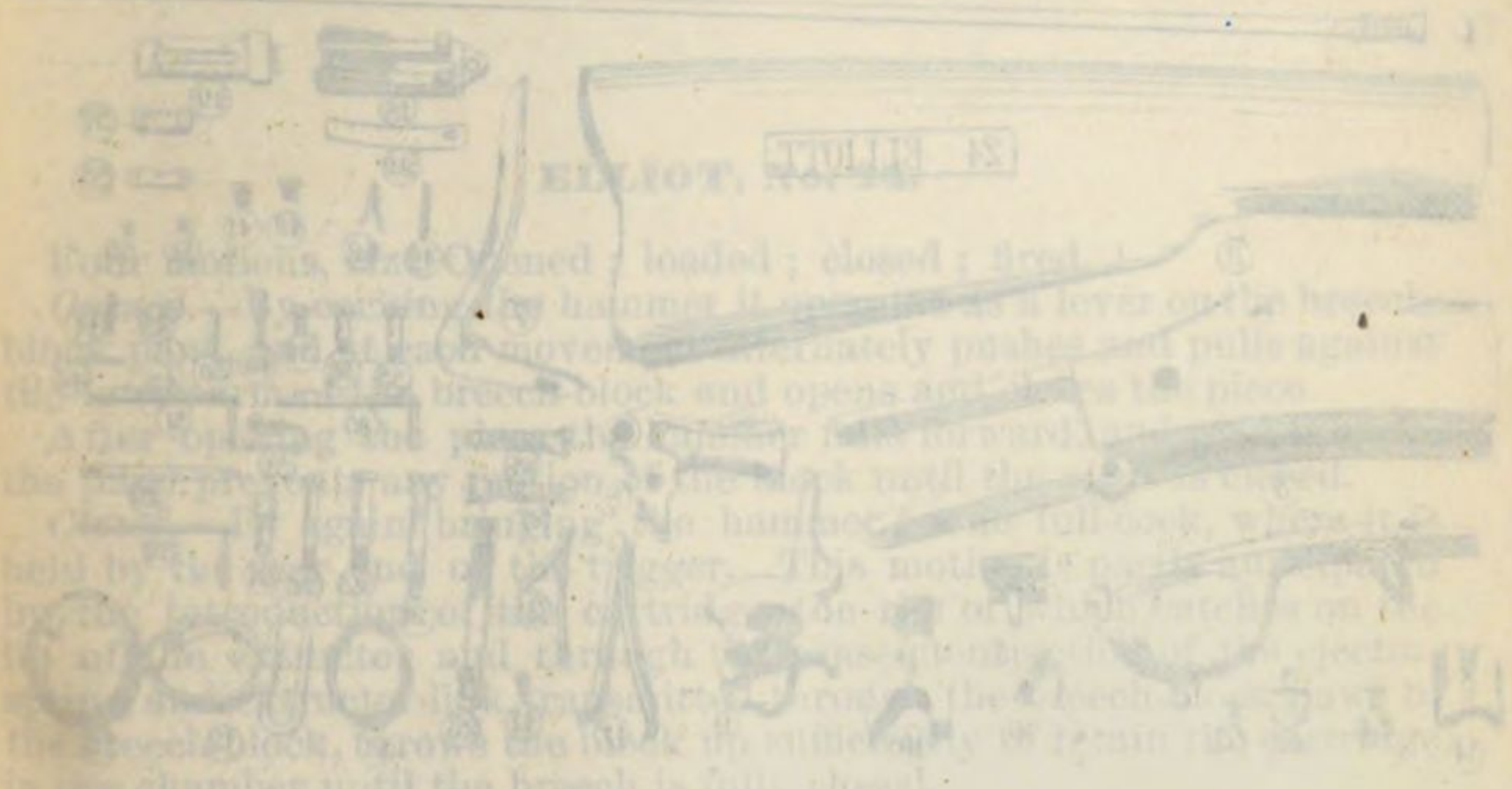
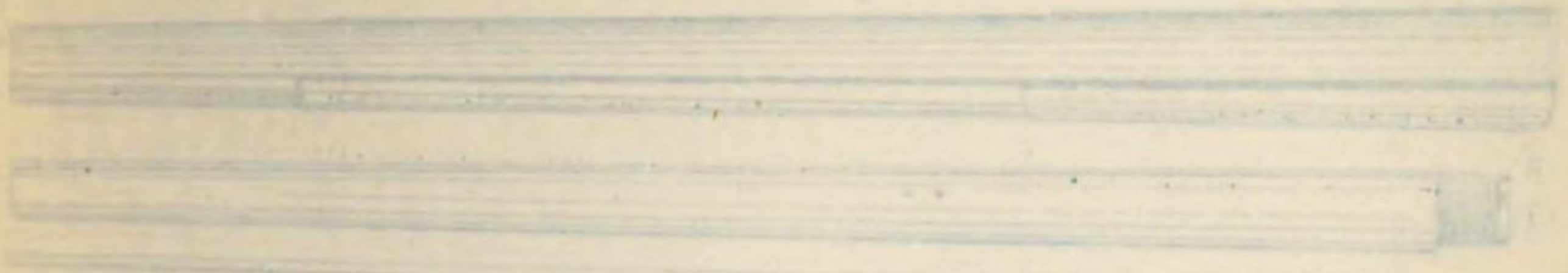
23 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 2 Barrel and Front Sight,
- 3 Rear Sight Base,
- 4 Rear Sight Base Screw,
- 5 Rear Sight Spring,
- 6 Rear Sight Joint Screw,
- 7 Rear Sight Leaf,
- 8 Rear Sight Leaf Slide,
- 9 Rear Sight Leaf Screw,

- 19 Butt Plate,
- 20 Butt Plate Screw,
- 21 Butt Plate Screw,
- 22 Upper Band,
- 23 Upper Band Swivel,
- 24 Upper Band Swivel Scr.,
- 25 Upper Band Spring,
- 26 Lower Band,

- 27 Lower Band Screw,
- 28 Lower Band Spring,
- 49 Tip,
- 50 Tip Screw,
- 17 Guard Bow Swivel,
- 18 Guard Bow Swivel Screw.

ROBERTS, No. 64.

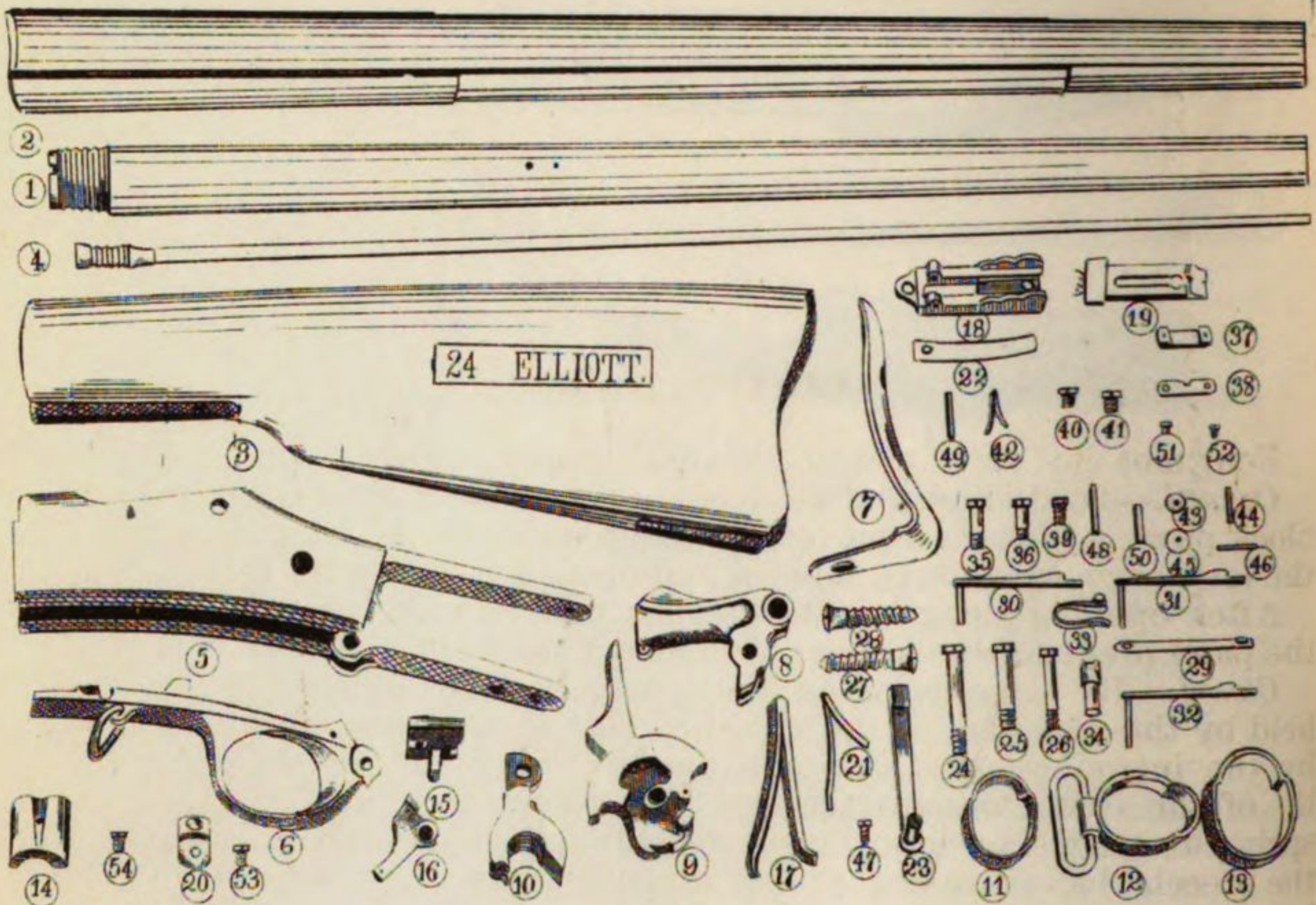


By the position of the breech-block and by its being locked against the head of the cartridge when the piece is in position, the breech-block is prevented from moving forward by the hammer falling behind a shoulder on the pawl to prevent its movement in an opening.

By the position of the breech-block and by its being locked against the head of the cartridge when the piece is in position, the breech-block is prevented from moving forward by the hammer falling behind a shoulder on the pawl to prevent its movement in an opening.

PARTS NOT PERTINENT TO THE SYSTEM, OR COMMON TO ALL		PARTS NOT PERTINENT TO THE SYSTEM, OR COMMON TO ALL	
1	Barrel	1	Barrel
2	Hammer	2	Hammer
3	Right Pawl	3	Right Pawl
4	Left Pawl	4	Left Pawl
5	Right Pawl Spring	5	Right Pawl Spring
6	Left Pawl Spring	6	Left Pawl Spring
7	Right Pawl	7	Right Pawl
8	Left Pawl	8	Left Pawl
9	Right Pawl Spring	9	Right Pawl Spring
10	Left Pawl Spring	10	Left Pawl Spring
11	Right Pawl	11	Right Pawl
12	Left Pawl	12	Left Pawl
13	Right Pawl Spring	13	Right Pawl Spring
14	Left Pawl Spring	14	Left Pawl Spring
15	Right Pawl	15	Right Pawl
16	Left Pawl	16	Left Pawl
17	Right Pawl Spring	17	Right Pawl Spring
18	Left Pawl Spring	18	Left Pawl Spring
19	Right Pawl	19	Right Pawl
20	Left Pawl	20	Left Pawl
21	Right Pawl Spring	21	Right Pawl Spring
22	Left Pawl Spring	22	Left Pawl Spring
23	Right Pawl	23	Right Pawl
24	Left Pawl	24	Left Pawl
25	Right Pawl Spring	25	Right Pawl Spring
26	Left Pawl Spring	26	Left Pawl Spring
27	Right Pawl	27	Right Pawl
28	Left Pawl	28	Left Pawl
29	Right Pawl Spring	29	Right Pawl Spring
30	Left Pawl Spring	30	Left Pawl Spring
31	Right Pawl	31	Right Pawl
32	Left Pawl	32	Left Pawl
33	Right Pawl Spring	33	Right Pawl Spring
34	Left Pawl Spring	34	Left Pawl Spring
35	Right Pawl	35	Right Pawl
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37	Right Pawl Spring	37	Right Pawl Spring
38	Left Pawl Spring	38	Left Pawl Spring
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41	Right Pawl Spring	41	Right Pawl Spring
42	Left Pawl Spring	42	Left Pawl Spring
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96	Left Pawl	96	Left Pawl
97	Right Pawl Spring	97	Right Pawl Spring
98	Left Pawl Spring	98	Left Pawl Spring
99	Right Pawl	99	Right Pawl
100	Left Pawl	100	Left Pawl

ELLIOT, Nov 24



32 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

TWO of Wood :
 2 Tip Stock,
 3 Butt Stock.

*TEN principal metallic parts
 not otherwise mentioned :*

8 Breech Block,
 29 Firing Pin,
 34 Firing Pin, Upper Section
 5 Frame,
 6 Guard,
 15 Extractor,
 16 Trigger,
 28 Extractor Link,
 9 Hammer,

10 Breech Block Pawl.
EIGHT Screws :
 39 Main Spring Set Screw,
 35 Rear Guard Screw,
 36 Front Guard Screw,
 47 Breech Block Pawl Spring
 Screw,
 25 Hammer Screw,
 26 Breech Block Screw,
 24 Tang Screw,
 53 Recoil Stud Screw.

FOUR Pins :
 44 Extractor Friction Roll
 Pin,

48 Trigger Pin,
 46 Main Spring Friction Roll
 Pin,
 50 Ejector Spring Pin.

FOUR Springs :
 33 Ejector Spring,
 17 Main Spring,
 42 Trigger Spring,
 21 Br'ch Block Pawl Spring.

FOUR other minor parts :
 43 Extractor Friction Roll,
 45 Main Spring Friction Roll,
 20 Recoil Stud,
 20 Recoil Stud Pin.

27 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

1 Barrel,
 4 Ramrod,
 7 Butt Plate,
 27 Butt Plate Screw,
 28 Butt Plate Screw,
 11 Upper Band,
 30 Upper Band Spring,
 12 Middle Band, Swivel and
 Pin,

31 Middle Band Spring,
 13 Lower Band,
 32 Lower Band Spring,
 14 Tip,
 54 Tip Screw,
 18 Rear Sight Base,
 19 Rear Sight Leaf,
 37 Rear Sight Leaf Slide,
 38 Rear Sight Leaf Slide Cap,

51 Rear Sight Leaf Slide Cap
 Screw,
 52 Rear Sight Leaf Slide Cap
 Screw,
 22 Rear Sight Spring,
 49 Rear Sight Joint Screw,
 40 Rear Sight Base Screw,
 41 Rear Sight Base Screw,
 6 Guard Swivel and Pin.

ELLIOT, No. 24.

ELLIOT, No. 24.

Four motions, viz: Opened ; loaded ; closed ; fired.

Opened.—By cocking the hammer it operates as a lever on the breech-block pawl, and at each movement alternately pushes and pulls against the lower arm of the breech-block and opens and closes the piece.

After opening the piece the hammer falls forward, and resting upon the pawl prevents any motion of the block until the piece is closed.

Closed.—By again bringing the hammer to the full-cock, where it is held by the sear end of the trigger. This motion is partly anticipated by the introduction of the cartridge, the rim of which catches on the lip of the extractor and through the consequent action of the ejector-spring and extractor-link transmitted through the breech-block pawl to the breech-block, throws the block up sufficiently to retain the cartridge in the chamber until the breech is fully closed.

Locked.—By the position of the breech-block and by its friction against the head of the cartridge when the piece is fired. It is also braced by the hammer falling behind a shoulder on the pawl, to prevent its movement as in opening.

Fired.—By the usual center-lock and a firing-pin in two sections, one of which moves with the block and the other remains in the frame.

Extraction.—By a lever pivoted below the chamber and worked through the intervening extractor-link by the movement of the hammer on the pawl.

Ejection.—By an auxiliary spring playing on friction-roller eccentrically placed in the extractor.

Remarks.—The guard is hinged at its rear end so as to afford a ready means of inspecting or cleaning the mechanism.

The lock is so constructed that the hammer cannot be let down slowly upon the firing-pin by the thumb.

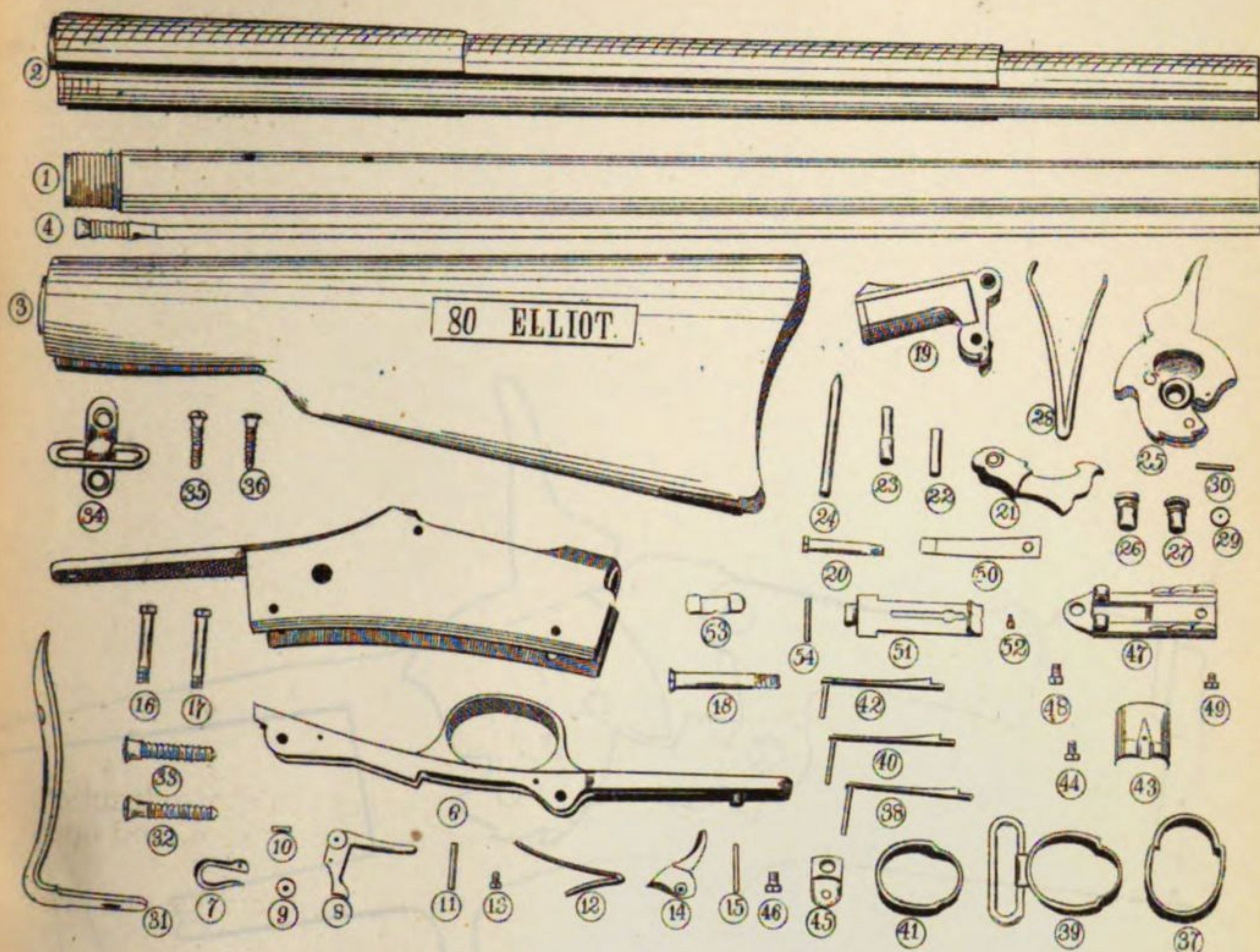
ELLIOT, No. 80.

Four motions, (as in No. 24.) Like No. 24, except in the extraction.

Extraction.—Is effected by a bent lever of the usual form, and operated by the descent of the breech-block.

The peculiarities of construction mentioned in remarks are also omitted.

The breech-block pawl in this arm is single, and works within the cheeks of a slit hammer. In No. 24 the hammer is single and there is a double pawl.



35 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 2 Tip Stock,
- 3 Butt Stock.

TEN principal metallic parts not otherwise mentioned :

- 5 Frame,
- 6 Guard Plate,
- 8 Extractor,
- 9 Ejector Spring Roll,
- 14 Trigger,
- 19 Breech Block,
- 21 Breech Block Pawl,
- 23 Firing Pin, Upper Section
- 24 Firing Pin, Lower Section
- 25 Hammer.

EIGHT Screws :

- 13 Br'ch Block Pawl Spring Screw,
- 16 Guard Screw,
- 17 Guard Screw,
- 18 Tang Screw,
- 20 Breech Block Screw,
- 26 Hammer Screw, Right
- 27 Hammer Screw, Left
- 46 Recoil Stud Screw.

NINE Pins :

- 6 Ejector Spring Pin,
- 6 Main Spring Stop Pin,
- 10 Ejector Spring Roll Pin,
- 11 Extractor Pin,

- 15 Trigger Pin,
- 22 Breech Block Pawl Pin,
- 25 Breech Block Pawl Stop Pin,
- 25 Breech Block Pawl Stop Pin,
- 30 Main Spring Friction Roll Pin.

THREE Springs :

- 7 Ejector Spring,
- 12 Breech Block Pawl Spr'g,
- 28 Main Spring.

THREE other minor parts.

- 29 Main Spring Friction Roll,
- 45 Recoil Stud,
- 45 Recoil Stud Dowel Pin.

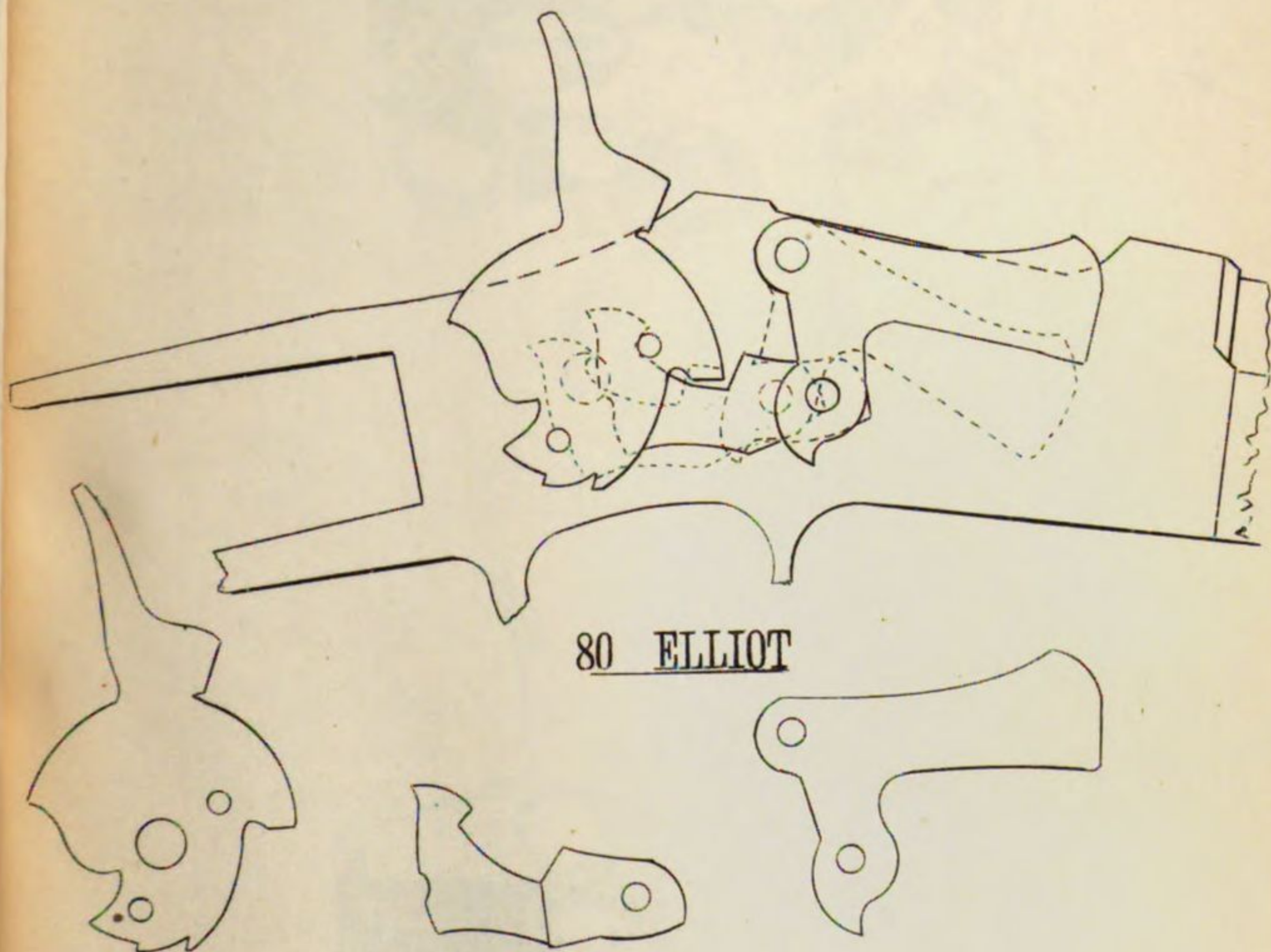
28 PARTS NOT PECULIAR TO THE SYSTEM OR COMMON TO ALL ARMS.

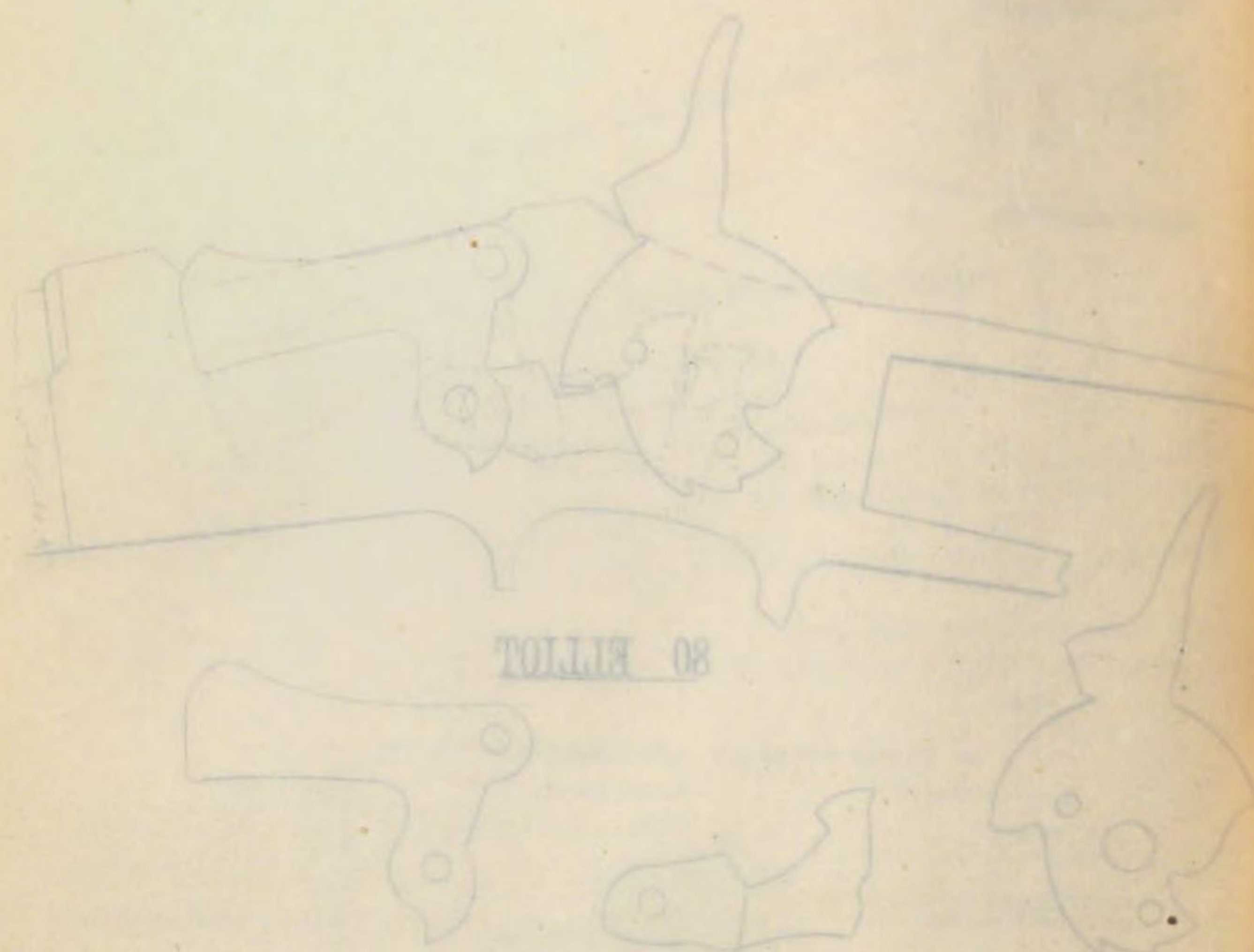
- 1 Barrel,
- 4 Ramrod,
- 31 Butt Plate,
- 32 Butt Plate Screw,
- 33 Butt Plate Screw,
- 34 Swivel Plate, Swivel and Pin,
- 35 Swivel Plate Screw,
- 36 Swivel Plate Screw,

- 37 Lower Band,
- 38 Lower Band Spring,
- 39 Middle Band, Swivel and Pin,
- 40 Middle Band Spring,
- 41 Upper Band,
- 42 Upper Band Spring,
- 43 Tip,
- 44 Tip Screw,

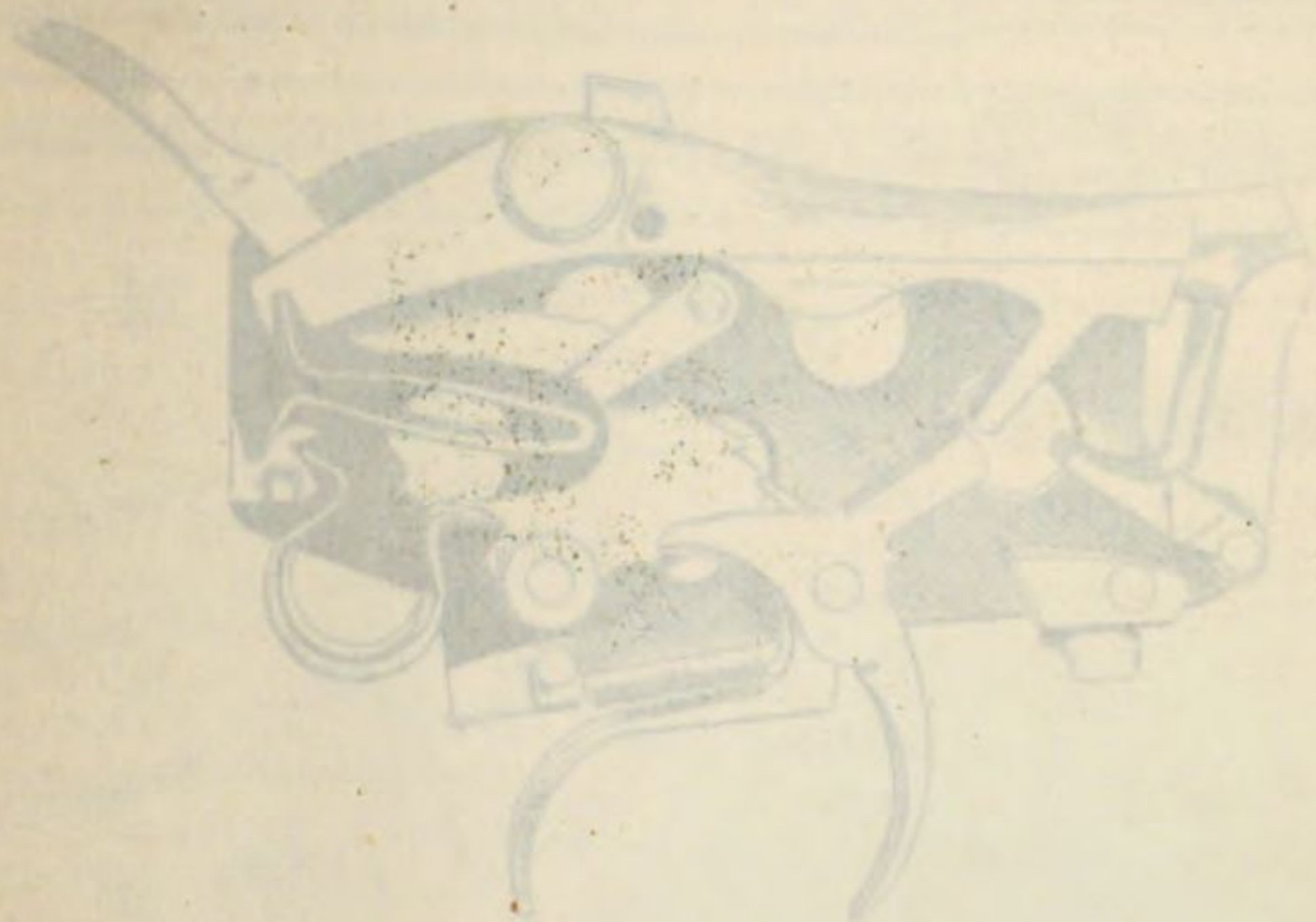
- 47 Rear Sight Base,
- 48 Rear Sight Base Screw,
- 49 Rear Sight Base Screw,
- 50 Rear Sight Spring,
- 51 Rear Sight Leaf,
- 53 Rear Sight Leaf Slide,
- 52 Rear Sight Leaf Screw,
- 54 Rear Sight Joint Pin.

ELLIOT, No. 80.

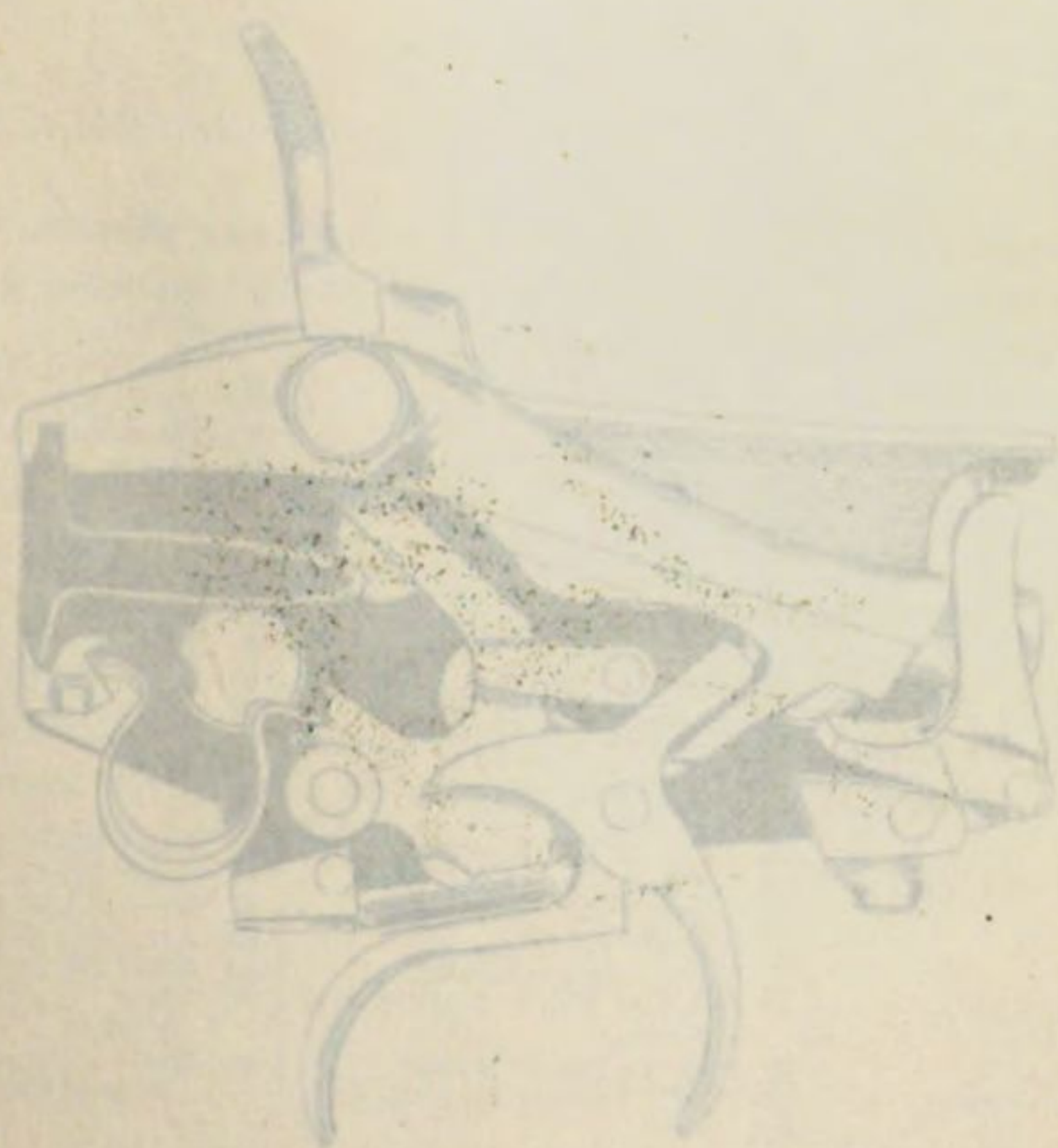




80 ELLIOT

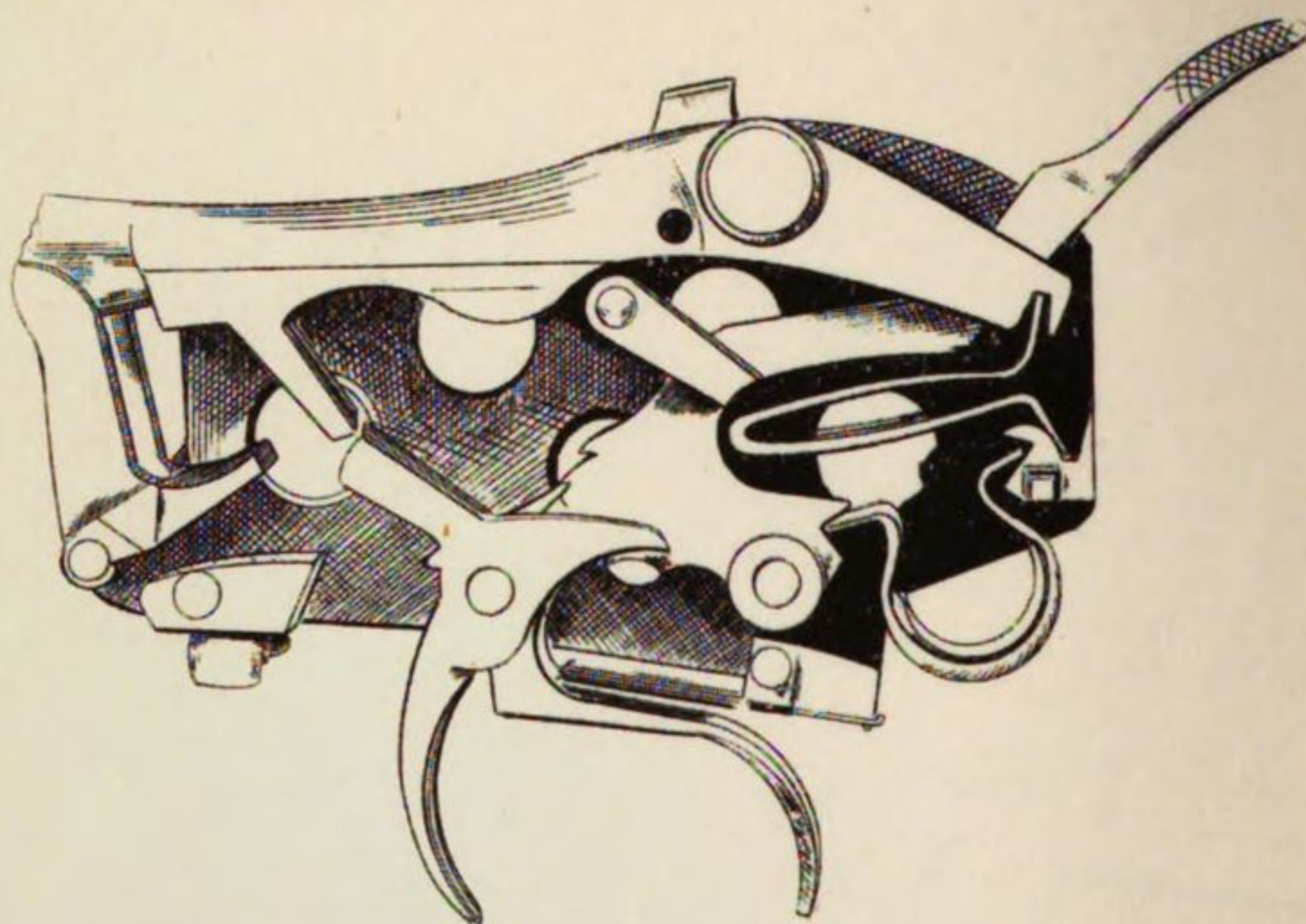


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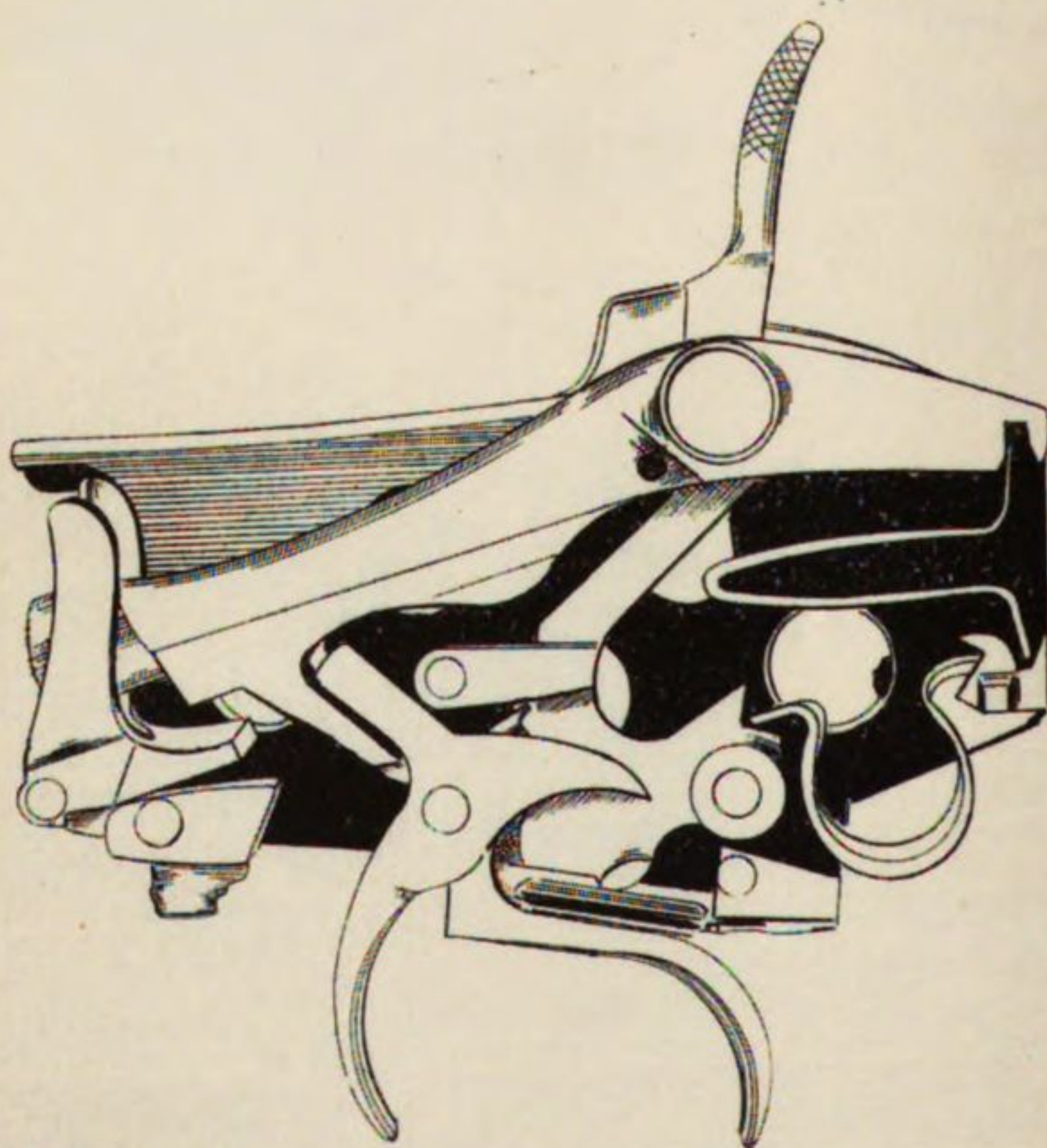


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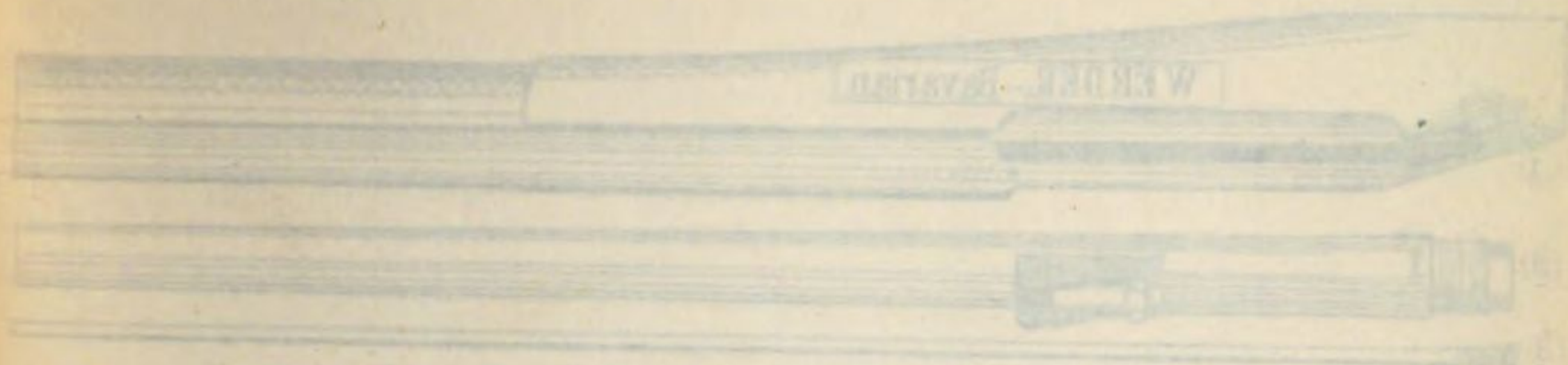
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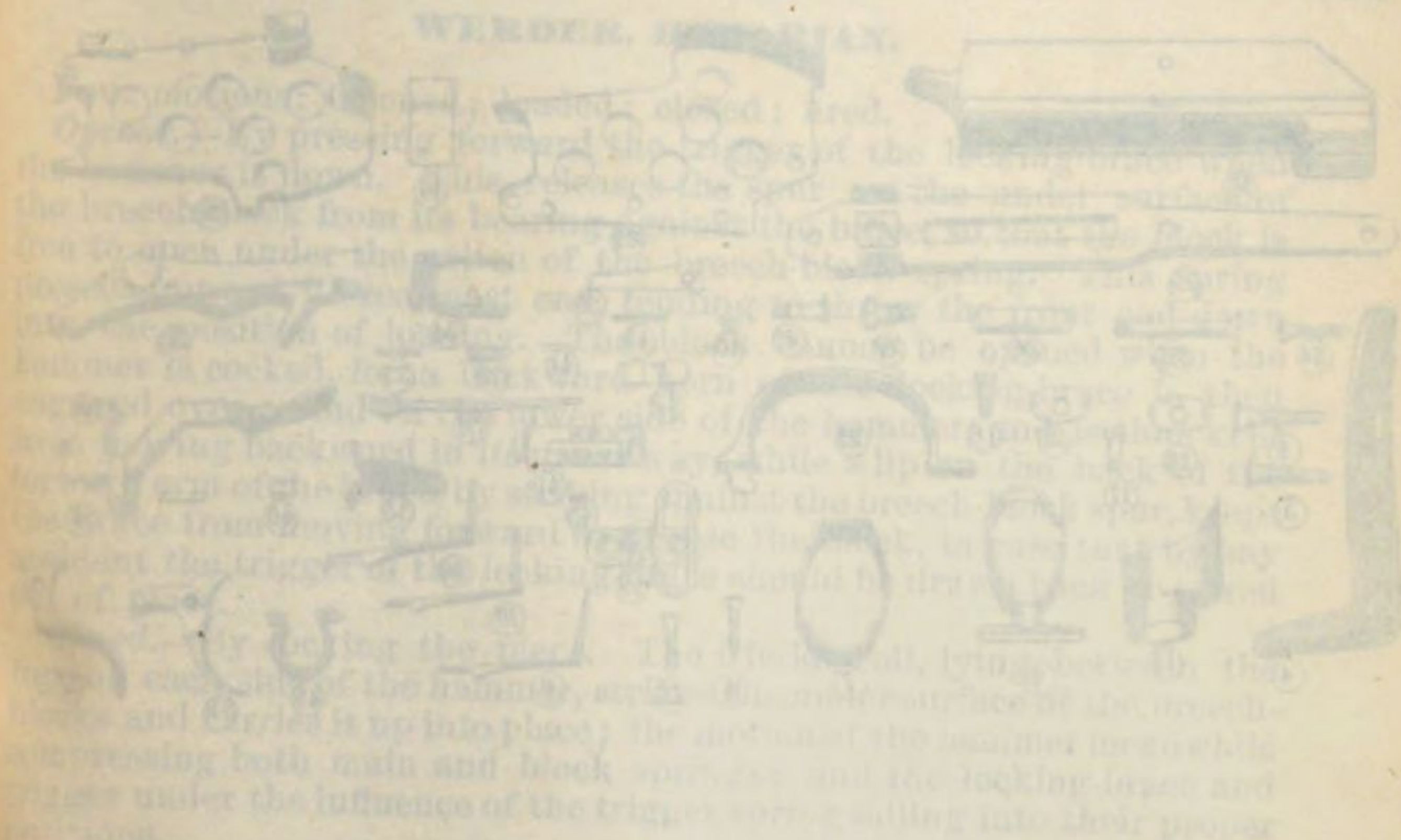
WERDER.--Bavarian.



WERDER.--Bavarian.

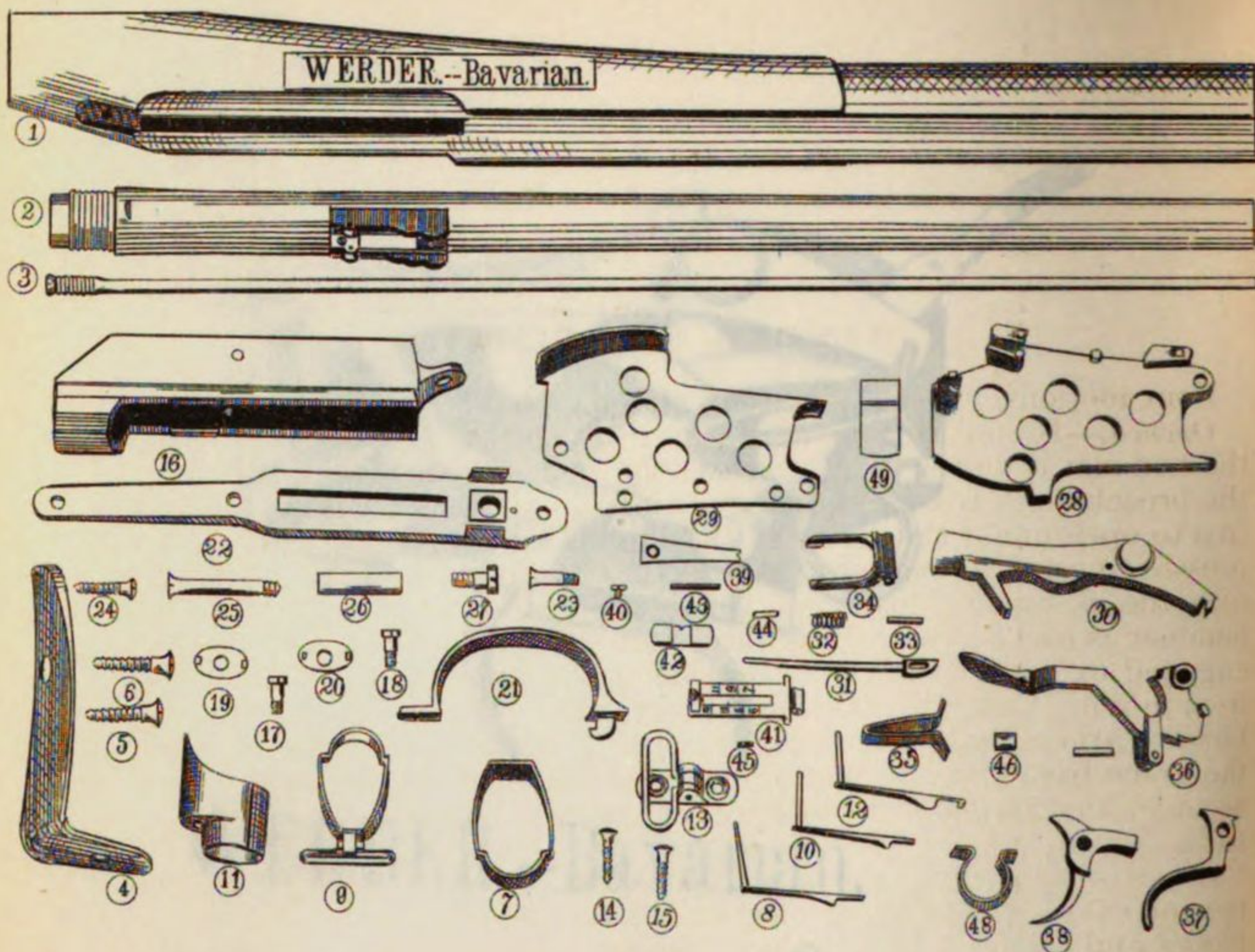


WELDER, HENRY.



List of Tools and Equipment	
1. Hammer	2. Saw
3. Chisel	4. Wrench
5. Screwdriver	6. Pliers
7. Nail	8. Bolt
9. Nut	10. Washer
11. Rivet	12. Gasket
13. Seal	14. Plug
15. Pin	16. Cotter
17. Pin	18. Pin
19. Pin	20. Pin
21. Pin	22. Pin
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95. Pin	96. Pin
97. Pin	98. Pin
99. Pin	100. Pin

WELDER, HENRY.



31 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

ONE of Wood:

1 Stock.

TWELVE principal metallic parts not otherwise mentioned:

16 Receiver,
21 Guard,
22 Guard Plate,
28 Frame, Right Section
29 Frame, Left Section
30 Breech Block,
31 Firing Pin,
34 Extractor,
36 Hammer,

37 Trigger,
38 Locking Brace,
46 Hammer Friction Roll.

SIX Screws:

17 Receiver Stop Screw,
18 Receiver Stop Screw,
23 Guard Screw, Upper
24 Guard Screw, Lower
25 Tang Screw,
27 Recoil Screw.

FOUR Pins:

28 Hammer Pin,
28 Locking Brace Pin,
33 Firing Pin Stop Pin,

47 Hammer Friction Roll Pin.

FOUR Springs:

32 Firing Pin Spring,
35 Breech Block Spring,
49 Trigger Spring,
48 Main Spring.

FOUR other minor parts:

19 Receiver Stop Scr. Washer,
20 Receiver Stop Scr. Washer,
26 Tang Screw Thimble,
28 Main Spring and Ejector Spring Bolster.

29 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

2 Barrel, Rear Sight Base, Front Sight and 2 Bayonet Studs,
3 Ramrod,
4 Butt Plate,
5 Butt Plate Screw,
6 Butt Plate Screw,
7 Lower Band,
8 Lower Band Spring,

9 Middle Band, Swivel and Pin,
10 Middle Band Spring,
11 Upper Band,
12 Upper Band Spring,
13 Swivel Plate, Swivel and Rivet,
14 Swivel Plate Screw,
15 Swivel Plate Screw,

39 Rear Sight Spring,
40 Rear Sight Spring Screw,
41 Rear Sight Leaf,
42 Rear Sight Leaf Slide,
43 Rear Sight Joint Pin,
44 Rear Sight Leaf Slide Wedge,
45 Rear Sight Leaf Slide Stop Screw.

WERDER, [BAVARIAN]:

WERDER, BAVARIAN.

Four motions: Opened; loaded; closed; fired.

Opened.—By pressing forward the trigger of the locking-brace when the hammer is down. This releases the spur on the under surface of the breech-block from its bearing against the brace, so that the block is free to open under the action of the breech-block spring. This spring presses upward its rearmost end, tending to throw the front end down into the position of loading. The block cannot be opened when the hammer is cocked, for a backward horn of the locking-brace is then engaged over a stud on the lower side of the hammer, and is thus kept from moving backward in its usual way, while a lip on the back of the forward arm of the brace, by striking against the breech-block spur, keeps the brace from moving forward to release the block, in case that by any accident the trigger of the locking-brace should be drawn back or jarred out of place.

Closed.—By cocking the piece. The friction-roll, lying between the lugs on each side of the hammer, strikes the under surface of the breech-blocks and carries it up into place; the motion of the hammer meanwhile compressing both main and block springs; and the locking-brace and trigger under the influence of the trigger-spring falling into their proper positions.

Locked.—When closed the piece is locked by the position of the block, and also by the support given by the locking-brace.

Fired.—By the means already described, the force of the mainspring being so much diminished, when the hammer has delivered its blow, that the tension of the firing-pin spring is sufficient to overcome the pressure of the hammer on the head of the firing-pin, and to withdraw its point from the face of the block.

Extracted and ejected.—By bent levers on each side of the chamber, worked as is usual in arms of this class.

The frame of this gun is cut out for the sake of lightness; it is slipped into a receiver connected with the barrel and secured there by the usual attachments. The breech-block is made solid with trunnions, instead of having the usual hinge-pin and hole.

SMOOT, NO. 32.

Five motions, two of which, *i. e.*, loading and closing, may be combined: Cocked; opened; loaded; closed; fired.

Opened.—By cocking the hammer and drawing back the thumb-piece of the cam-lever. A projecting stud on the cam-lever (not shown in the illustration) playing in the cam-recess of the breech-block draws it down into the position of loading.

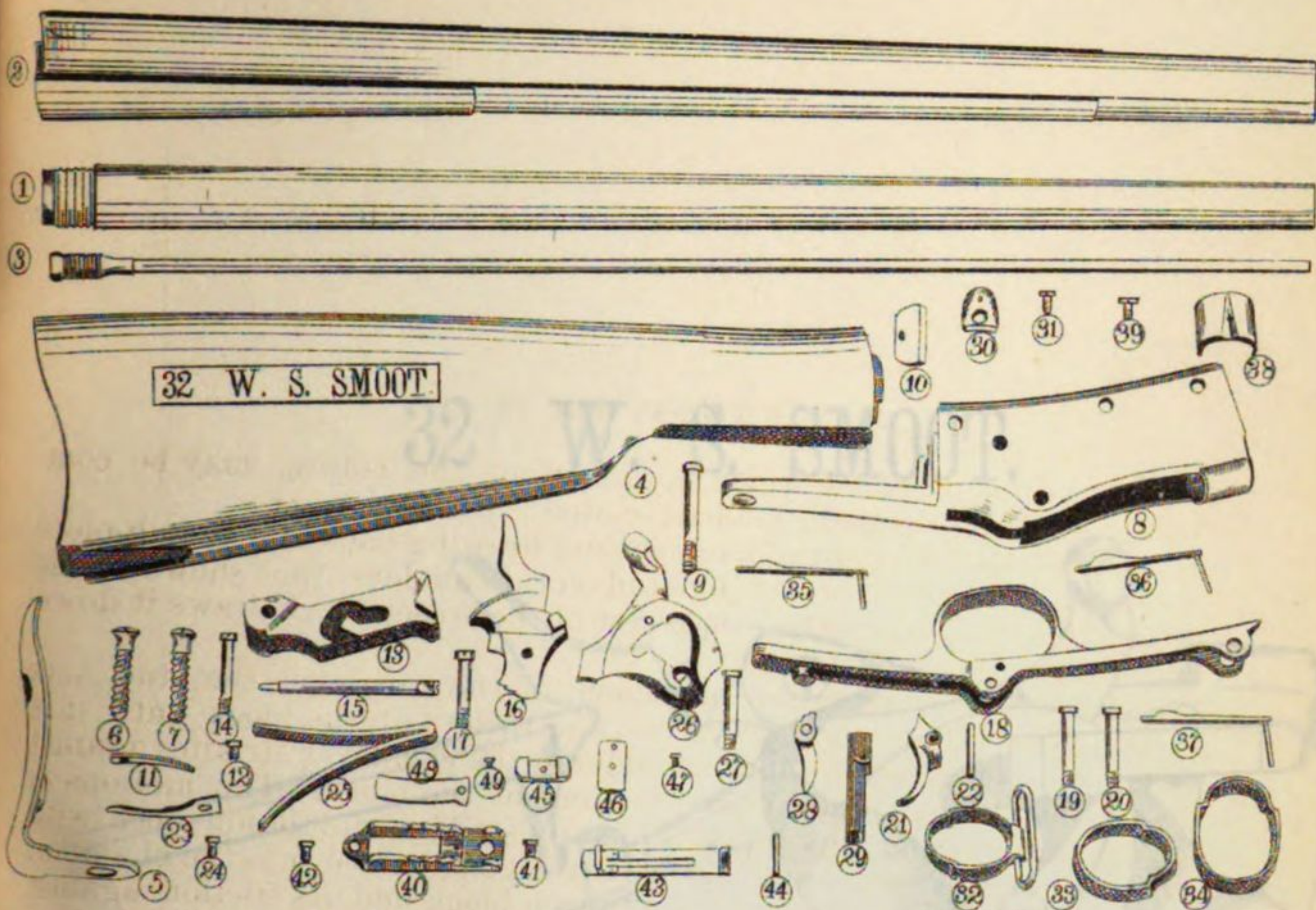
Closed.—By reversing the movement of the cam-lever, the stud acts on the other side of the cam-recess, and throws up the block until it is met and stopped by the front shoulder of the cam-lever striking against a corresponding shoulder near the front of the block. The motions of loading and closing may be combined by striking the thumb-piece with the palm of the right hand as the cartridge is passed into the chamber.

Locked.—By the position of the breech-block and its friction against the head of the cartridge when the piece is fired. It is still further secured by a projection on the hammer passing under the rear end of the cam-lever, and making it serve as an immovable brace for the block.

Fired.—By a double mainspring center-lock of the usual pattern.

Extraction.—By a sliding extractor, a stud on the inside of which plays in a cam-recess on the outer side of the cam-lever. After passing a certain point in opening the piece the direct pull on the extractor ceases and the ejection is secured—

Ejection.—By the acceleration impressed on the extractor by the action of the ejector-spring on a cam formed on the lower surface of the ejector-lever. The upper end of which lever, striking a shoulder on the extractor, throws it into a groove connected with the cam-recess, driving the shell up the inclined surface of the breech-block until it is clear of the gun.



27 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 2 Tip Stock,
- 4 Butt Stock.

NINE principal metallic parts not otherwise mentioned :

- 13 Breech Block,
- 15 Firing Pin,
- 8 Frame,
- 16 Hammer,
- 18 Guard,
- 21 Trigger,

- 29 Extractor,
- 28 Ejector Lever,
- 26 Cam Lever.

NINE Screws :

- 14 Breech Block Hinge Scr.,
- 12 Breech Block Spring Scr.,
- 17 Hammer Screw,
- 19 Guard Screw,
- 20 Guard Screw,
- 24 Ejector Spring Screw,
- 27 Cam Lever Screw,
- 9 Tang Screw,

- 31 Recoil Stud Screw.

Two Pins :

- 22 Trigger Pin,
- 8 Main Spring Stop Pin.

THREE Springs :

- 11 Breech Block Spring,
- 25 Main Spring,
- 23 Ejector Spring.

Two other minor parts :

- 30 Recoil Stud,
- 30 Recoil Stud Dowel Pin.

27 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

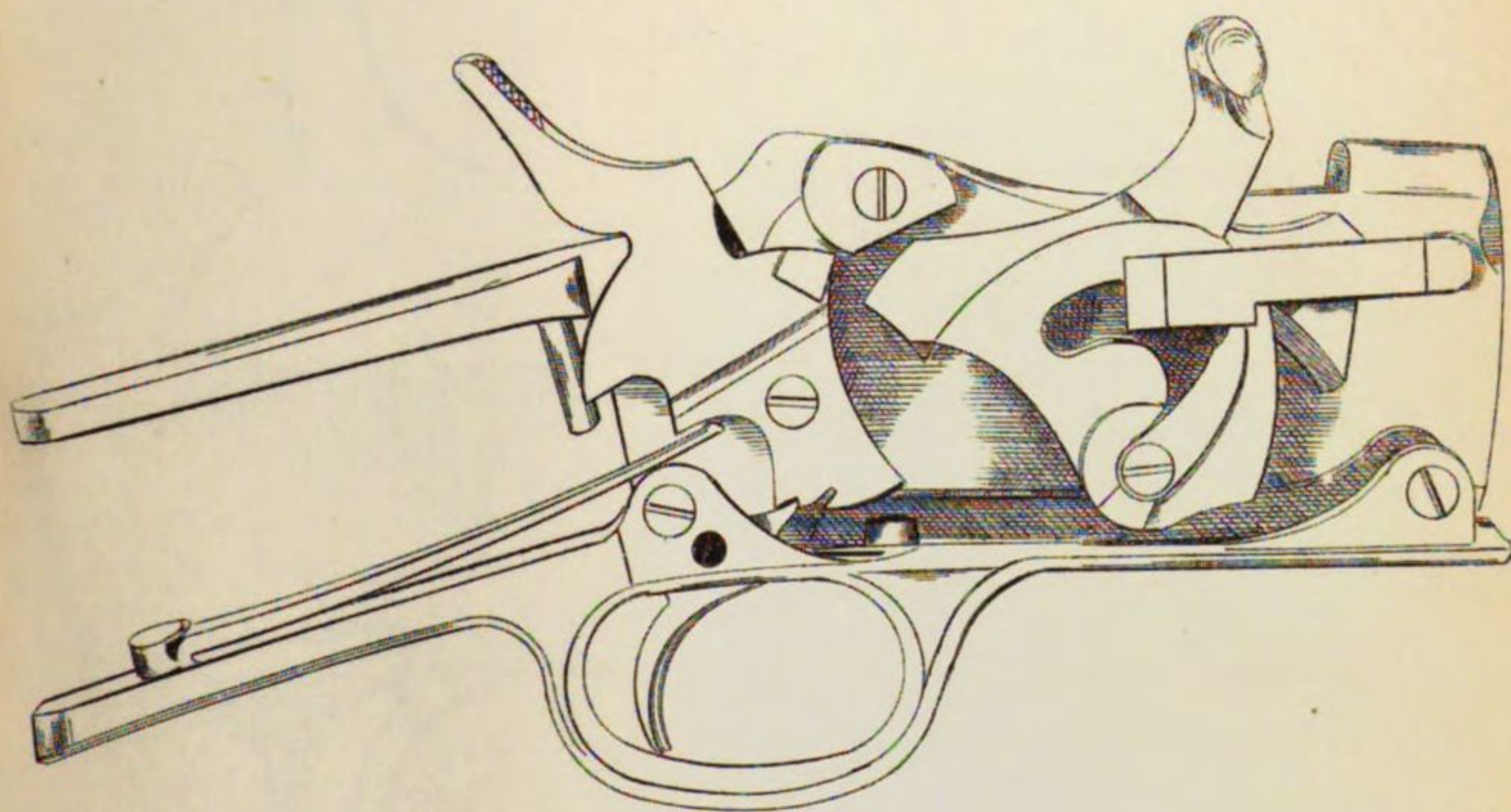
- 1 Barrel and Front Sight,
- 3 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 32 Upper Band, Swivel and Pin,
- 35 Upper Band Spring,
- 33 Middle Band,

- 36 Middle Band Spring,
- 34 Lower Band,
- 37 Lower Band Spring,
- 38 Tip,
- 39 Tip Screw,
- 40 Rear Sight Base,
- 41 Rear Sight Base Screw,
- 42 Rear Sight Base Screw,
- 43 Rear Sight Leaf,

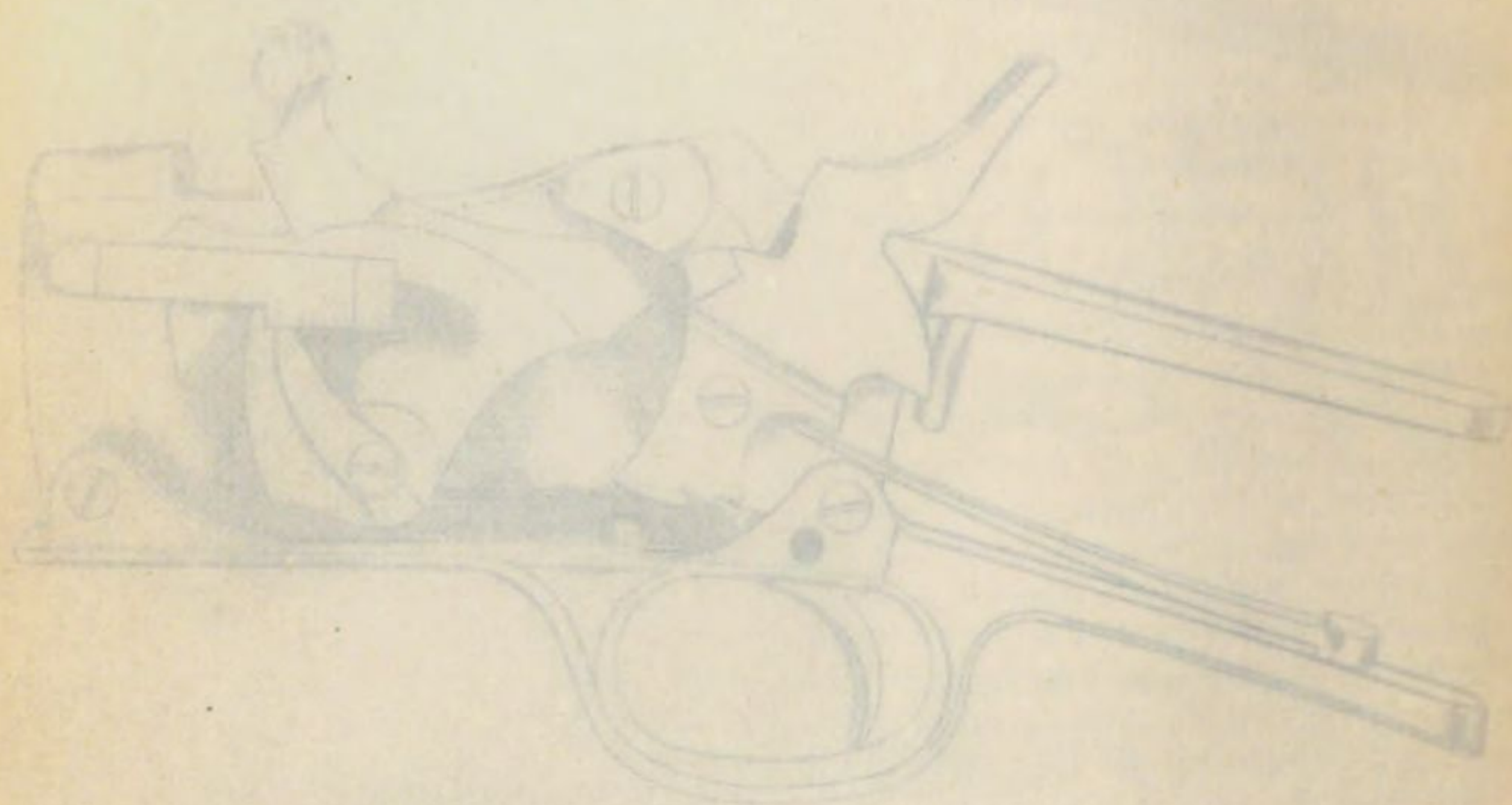
- 44 Rear Sight Joint Pin,
- 45 Rear Sight Leaf Slide,
- 46 Rear Sight Leaf Slide Spring,
- 47 Rear Sight Leaf Slide Spring Screw,
- 48 Rear Sight Spring,
- 49 Rear Sight Spring Screw,
- 10 Ramrod Stop.

SMOOT. No. 32.

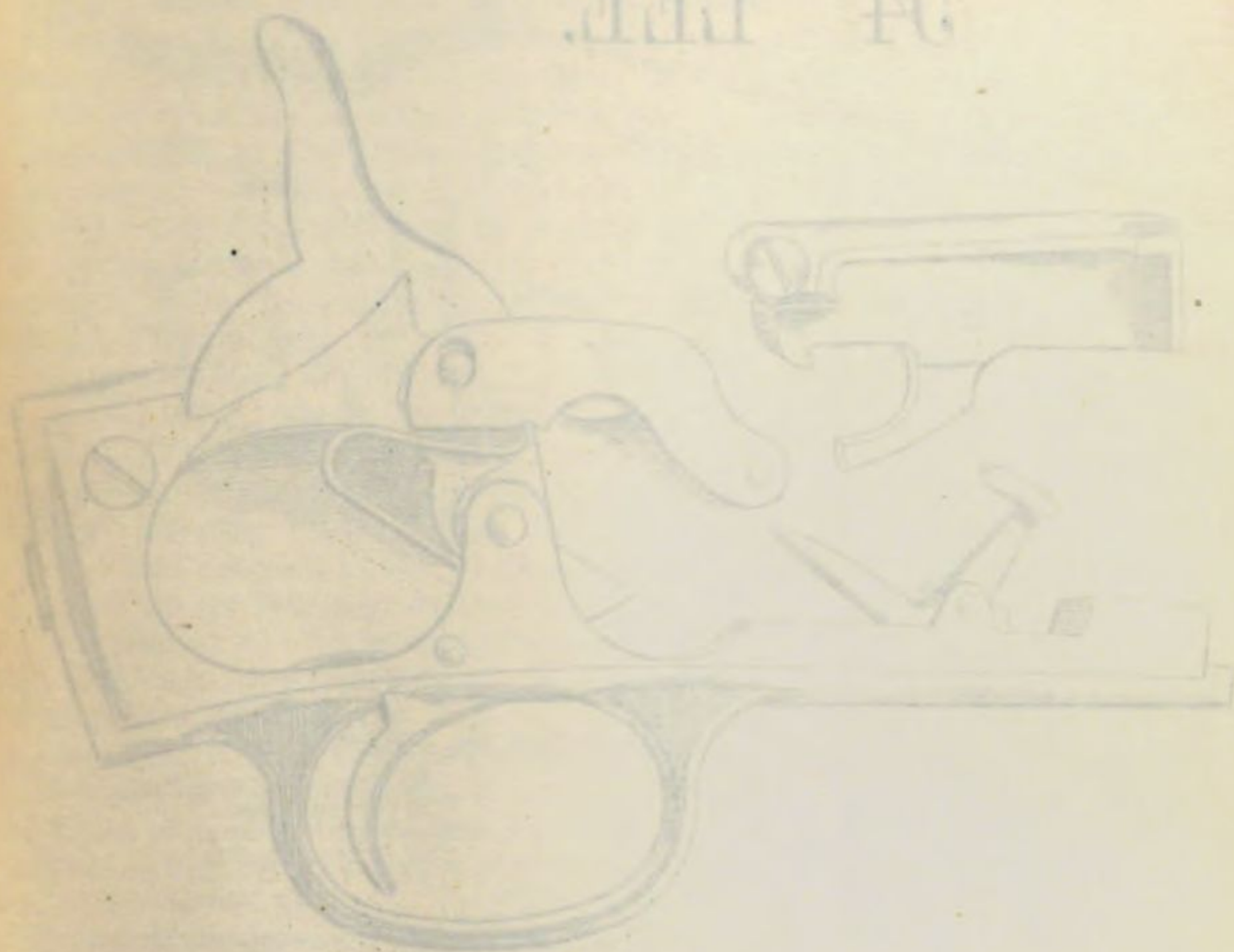
32 W. S. SMOOT.



38 W. 2. 200M2

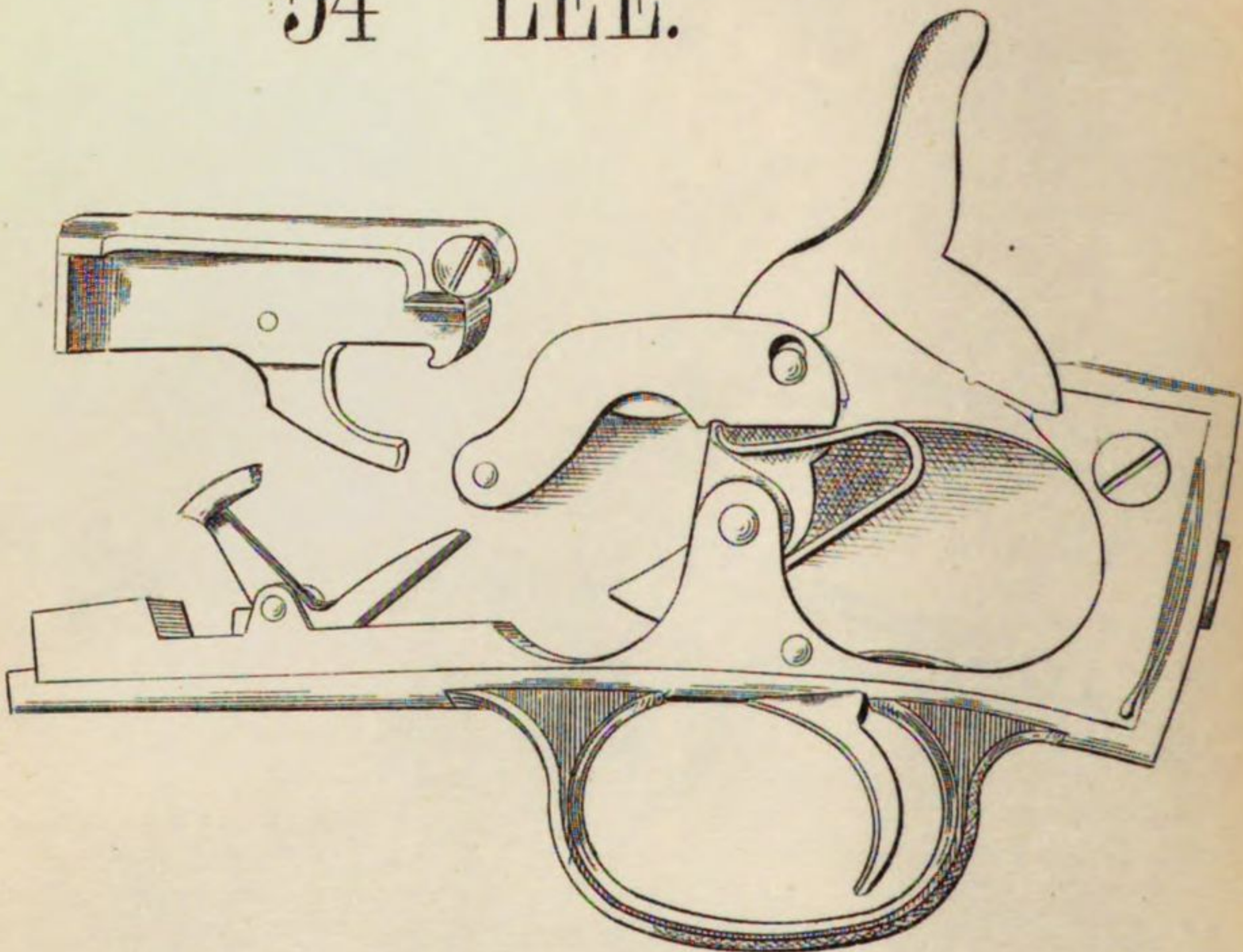


54 THE



The movement of illustration, the device block is
and it is little spread and forward.

54 LEE.



For convenience of illustration, the Breech Block is moved a little upward and forward.

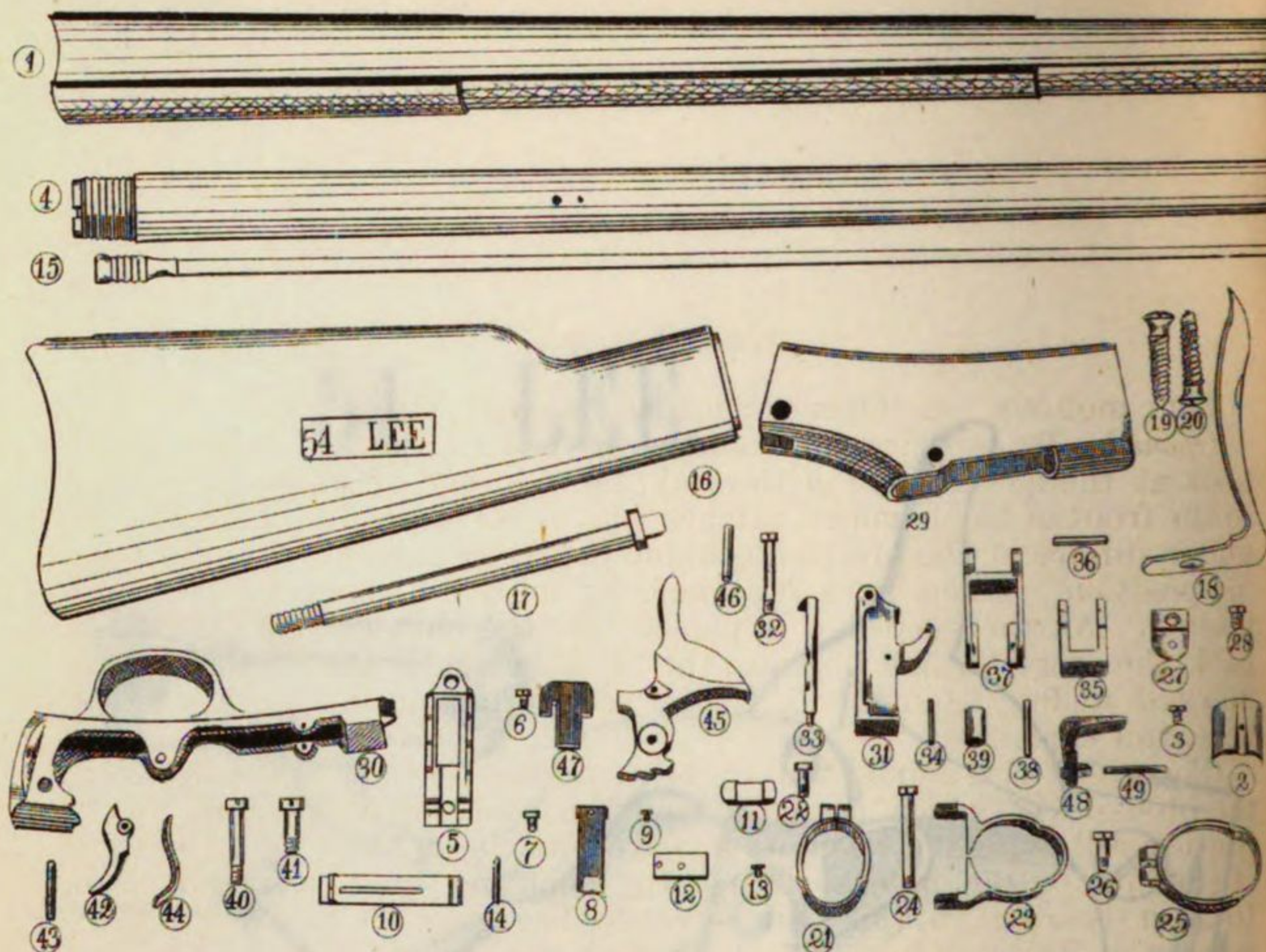
FIG. 55

the gun, viz: Open; Recoil; and Load. The gun is first opened by pulling the handle of the breech forward, which raises the breech and allows the shell to be loaded. The gun is then recoiled by pulling the handle of the breech backward, which lowers the breech and allows the shell to be fired. The gun is then loaded by pulling the handle of the breech forward, which raises the breech and allows the shell to be loaded.

The gun is then recoiled by pulling the handle of the breech backward, which lowers the breech and allows the shell to be fired. The gun is then loaded by pulling the handle of the breech forward, which raises the breech and allows the shell to be loaded. The gun is then recoiled by pulling the handle of the breech backward, which lowers the breech and allows the shell to be fired. The gun is then loaded by pulling the handle of the breech forward, which raises the breech and allows the shell to be loaded.

21	Upper Band	7	Lower Right Band	14	Lower Right Band
22	Tip	8	Lower Right Band	15	Lower Right Band
23	Tip	9	Lower Right Band	16	Lower Right Band
24	Tip	10	Lower Right Band	17	Lower Right Band
25	Tip	11	Lower Right Band	18	Lower Right Band
26	Tip	12	Lower Right Band	19	Lower Right Band
27	Tip	13	Lower Right Band	20	Lower Right Band
28	Tip	14	Lower Right Band	21	Lower Right Band
29	Tip	15	Lower Right Band	22	Lower Right Band
30	Tip	16	Lower Right Band	23	Lower Right Band
31	Tip	17	Lower Right Band	24	Lower Right Band
32	Tip	18	Lower Right Band	25	Lower Right Band
33	Tip	19	Lower Right Band	26	Lower Right Band
34	Tip	20	Lower Right Band	27	Lower Right Band
35	Tip	21	Lower Right Band	28	Lower Right Band
36	Tip	22	Lower Right Band	29	Lower Right Band
37	Tip	23	Lower Right Band	30	Lower Right Band
38	Tip	24	Lower Right Band	31	Lower Right Band
39	Tip	25	Lower Right Band	32	Lower Right Band
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41	Tip	27	Lower Right Band	34	Lower Right Band
42	Tip	28	Lower Right Band	35	Lower Right Band
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44	Tip	30	Lower Right Band	37	Lower Right Band
45	Tip	31	Lower Right Band	38	Lower Right Band
46	Tip	32	Lower Right Band	39	Lower Right Band
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49	Tip	35	Lower Right Band	42	Lower Right Band
50	Tip	36	Lower Right Band	43	Lower Right Band
51	Tip	37	Lower Right Band	44	Lower Right Band
52	Tip	38	Lower Right Band	45	Lower Right Band
53	Tip	39	Lower Right Band	46	Lower Right Band
54	Tip	40	Lower Right Band	47	Lower Right Band
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56	Tip	42	Lower Right Band	49	Lower Right Band
57	Tip	43	Lower Right Band	50	Lower Right Band
58	Tip	44	Lower Right Band	51	Lower Right Band
59	Tip	45	Lower Right Band	52	Lower Right Band
60	Tip	46	Lower Right Band	53	Lower Right Band
61	Tip	47	Lower Right Band	54	Lower Right Band
62	Tip	48	Lower Right Band	55	Lower Right Band
63	Tip	49	Lower Right Band	56	Lower Right Band
64	Tip	50	Lower Right Band	57	Lower Right Band
65	Tip	51	Lower Right Band	58	Lower Right Band
66	Tip	52	Lower Right Band	59	Lower Right Band
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68	Tip	54	Lower Right Band	61	Lower Right Band
69	Tip	55	Lower Right Band	62	Lower Right Band
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79	Tip	65	Lower Right Band	72	Lower Right Band
80	Tip	66	Lower Right Band	73	Lower Right Band
81	Tip	67	Lower Right Band	74	Lower Right Band
82	Tip	68	Lower Right Band	75	Lower Right Band
83	Tip	69	Lower Right Band	76	Lower Right Band
84	Tip	70	Lower Right Band	77	Lower Right Band
85	Tip	71	Lower Right Band	78	Lower Right Band
86	Tip	72	Lower Right Band	79	Lower Right Band
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94	Tip	80	Lower Right Band	87	Lower Right Band
95	Tip	81	Lower Right Band	88	Lower Right Band
96	Tip	82	Lower Right Band	89	Lower Right Band
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125	Tip	111	Lower Right Band	118	Lower Right Band
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128	Tip	114	Lower Right Band	121	Lower Right Band
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135	Tip	121	Lower Right Band	128	Lower Right Band
136	Tip	122	Lower Right Band	129	Lower Right Band
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161	Tip	147	Lower Right Band	154	Lower Right Band
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169	Tip	155	Lower Right Band	162	Lower Right Band
170	Tip	156	Lower Right Band	163	Lower Right Band
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191	Tip	177	Lower Right Band	184	Lower Right Band
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200	Tip	186	Lower Right Band	193	Lower Right Band
201	Tip	187	Lower Right Band	194	Lower Right Band
202	Tip	188	Lower Right Band	195	Lower Right Band
203	Tip	189	Lower Right Band	196	Lower Right Band
204	Tip	190	Lower Right Band	197	Lower Right Band
205	Tip	191	Lower Right Band	198	Lower Right Band
206	Tip	192	Lower Right Band	199	Lower Right Band
207	Tip	193	Lower Right Band	200	Lower Right Band
208	Tip	194	Lower Right Band	201	Lower Right Band
209	Tip	195	Lower Right Band	202	Lower Right Band
210	Tip	196	Lower Right Band	203	Lower Right Band
211	Tip	197	Lower Right Band	204	Lower Right Band
212	Tip	198	Lower Right Band	205	Lower Right Band
213	Tip	199	Lower Right Band	206	Lower Right Band
214	Tip	200	Lower Right Band	207	Lower Right Band
215	Tip	201	Lower Right Band	208	Lower Right Band
216	Tip	202	Lower Right Band	209	Lower Right Band
217	Tip	203	Lower Right Band	210	Lower Right Band
218	Tip	204	Lower Right Band	211	Lower Right Band
219	Tip	205	Lower Right Band	212	Lower Right Band
220	Tip	206	Lower Right Band	213	Lower Right Band
221	Tip	207	Lower Right Band	214	Lower Right Band
222	Tip	208	Lower Right Band	215	Lower Right Band
223	Tip	209	Lower Right Band	216	Lower Right Band
224	Tip	210	Lower Right Band	217	Lower Right Band
225	Tip	211	Lower Right Band	218	Lower Right Band
226	Tip	212	Lower Right Band	219	Lower Right Band
227	Tip	213	Lower Right Band	220	Lower Right Band
228	Tip	214	Lower Right Band	221	Lower Right Band
229	Tip	215	Lower Right Band	222	Lower Right Band
230	Tip	216	Lower Right Band	223	Lower Right Band
231	Tip	217	Lower Right Band	224	Lower Right Band
232	Tip	218	Lower Right Band	225	Lower Right Band
233	Tip	219	Lower Right Band	226	Lower Right Band
234	Tip	220	Lower Right Band	227	Lower Right Band
235	Tip	221	Lower Right Band	228	Lower Right Band
236	Tip	222	Lower Right Band	229	Lower Right Band
237	Tip	223	Lower Right Band	230	Lower Right Band
238	Tip	224	Lower Right Band	231	Lower Right Band
239	Tip	225	Lower Right Band	232	Lower Right Band
240	Tip	226	Lower Right Band	233	Lower Right Band
241	Tip	227	Lower Right Band	234	Lower Right Band
242	Tip	228	Lower Right Band	235	Lower Right Band
243	Tip	229	Lower Right Band	236	Lower Right Band
244	Tip	230	Lower Right Band	237	Lower Right Band
245	Tip	231	Lower Right Band	238	Lower Right Band
246	Tip	232	Lower Right Band	239	Lower Right Band
247	Tip	233	Lower Right Band	240	Lower Right Band
248	Tip	234	Lower Right Band	241	Lower Right Band
249	Tip	235	Lower Right Band	242	Lower Right Band
250	Tip	236	Lower Right Band	243	Lower Right Band
251	Tip	237	Lower Right Band	244	Lower Right Band
252	Tip	238	Lower Right Band	245	Lower Right Band
253	Tip	239	Lower Right Band	246	Lower Right Band
254	Tip	240	Lower Right Band	247	Lower Right Band
255	Tip	241	Lower Right Band	248	Lower Right Band
256	Tip	242	Lower Right Band	249	Lower Right Band
257	Tip	243	Lower Right Band	250	Lower Right Band
258	Tip	244	Lower Right Band	251	Lower Right Band
259	Tip	245	Lower Right Band	252	Lower Right Band
260	Tip	246	Lower Right Band	253	Lower Right Band
261	Tip	247	Lower Right Band	254	Lower Right Band
262	Tip	248	Lower Right Band	255	Lower Right Band
263	Tip	249	Lower Right Band	256	Lower Right Band
264	Tip	250	Lower Right Band	257	Lower Right Band
265	Tip	251	Lower Right Band	258	Lower Right Band
266	Tip	252	Lower Right Band	259	Lower Right Band
267	Tip	253	Lower Right Band	260	Lower Right Band
268	Tip	254	Lower Right Band	261	Lower Right Band
269	Tip	255	Lower Right Band	262	Lower Right Band
270	Tip	256	Lower Right Band	263	Lower Right Band
271	Tip	257	Lower Right Band	264	Lower Right Band
272	Tip	258	Lower Right Band	265	Lower Right Band
273	Tip	259	Lower Right Band	266	

FIG. 56



28 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:
 1 Tip Stock,
 16 Butt Stock.

TEN principal metallic parts
 not otherwise mentioned:

17 Butt Stock Bolt,
 31 Breech Block,
 33 Firing Pin,
 35 Link,
 37 Block Lever,
 30 Guard Plate,
 42 Trigger,

45 Hammer,
 48 Extractor,
 29 Receiver.

FOUR Screws:

32 Breech Block Joint Ser.,
 40 Guard Plate Screw, Upper
 41 Guard Plate Screw, Lower
 28 Recoil Stud Screw.

SEVEN Pins:

34 Firing Pin Stop Pin,
 36 Link Pin,
 38 Block Lever Friction Roll
 Pin,

30 Extractor Stop Pin,
 43 Trigger Pin,
 46 Hammer Pin,
 49 Extractor Pin.

TWO Springs:

44 Trigger Spring,
 47 Main Spring.

THREE other minor parts:

39 Block Lever Friction Roll,
 27 Recoil Stud,
 27 Recoil Stud Dowel Pin.

24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

4 Barrel and Front Sight,
 18 Butt Plate,
 19 Butt Plate Screw,
 20 Butt Plate Screw,
 15 Ramrod,
 2 Tip,
 3 Tip Screw,
 21 Upper Band,

22 Upper Band Screw,
 23 Middle Band,
 24 Middle Band Screw,
 25 Lower Band,
 26 Lower Band Screw,
 5 Rear Sight Base,
 6 Rear Sight Base Screw,
 7 Rear Sight Base Screw,

8 Rear Sight Spring,
 9 Rear Sight Spring Screw,
 10 Rear Sight Leaf,
 11 Rear Sight Leaf Slide,
 12 Rear Sight Leaf Slide Cap,
 13 Rear Sight Leaf Slide Cap
 Screw,
 14 Rear Sight Joint Pin.

LEE. No. 54.

LEE, NO. 54.

Four motions, viz: Opened; loaded; cocked; fired.

Opened.—By bringing the hammer to the half-cock; in so doing, the hook at the forward end of the link, the rear end of which is pivoted to the front of the hammer, catches into a corresponding notch on the under surface of the breech-block and depresses the block into the loading position. When down it is held by the overhanging lip of the extractor. As the cartridge is passed into the chamber, its rim pushes back the extractor and liberates the block, which is then free to move upward under the influence of the mainspring on the block-lever, as hereafter explained.

Closed.—If this should fail, by bringing the hammer to the full-cock, the block-lever, which is pivoted on the same pin as the link, by the friction-roll lying between its forward branches, passes over the front of the spur on the under surface of the block and throws it up into place. Its first bearing on this spur serves to disengage the block, by throwing out of its notch in the block, the link, the end of which overlies and is lifted up by the rear end of the block-lever.

The tension of the mainspring which is held between the block-lever and the front lower surface of the hammer, serves to throw up and keep in place the block-lever and link, and also through its bearing on the block-lever, to raise the breech-block as soon as the cartridge is inserted.

Locked.—By the position of the breech-block, and its friction against the head of the cartridge when the piece is fired.

Fired.—By the action of a center-lock moved by a mainspring of peculiar form.

Extraction—Ejection.—By a bent lever pivoted below the chamber and struck by the block in its descent.

Retraction.—There is a projection on the under side of the firing-pin near its head, against which the hook of the link catches in opening, and so withdraws the point of the firing-pin from its indentation in the head of the cartridge.

LEE, No. 61

Four motions, viz: Opened; loaded; cocked; fired.

Opened.—By shoving forward the thumb-piece of the hammer; this throws down the breech-block into the position of loading, where it is detained by the lip of the extractor engaging over its forward end.

Closed.—By inserting the cartridge, its rim catches against the extractor and pushes it back out of the way, so that the force of the mainspring, acting on the block by means of its connection with the hammer through the hammer-pin, presses the block against the cam-shaped surface of the hinge-pin, and when the extractor no longer interferes throws up the block until it is stopped by a projecting lip on its under surface striking the end of the barrel. The breech may also be closed by pressing back the extractor with the point of the finger.

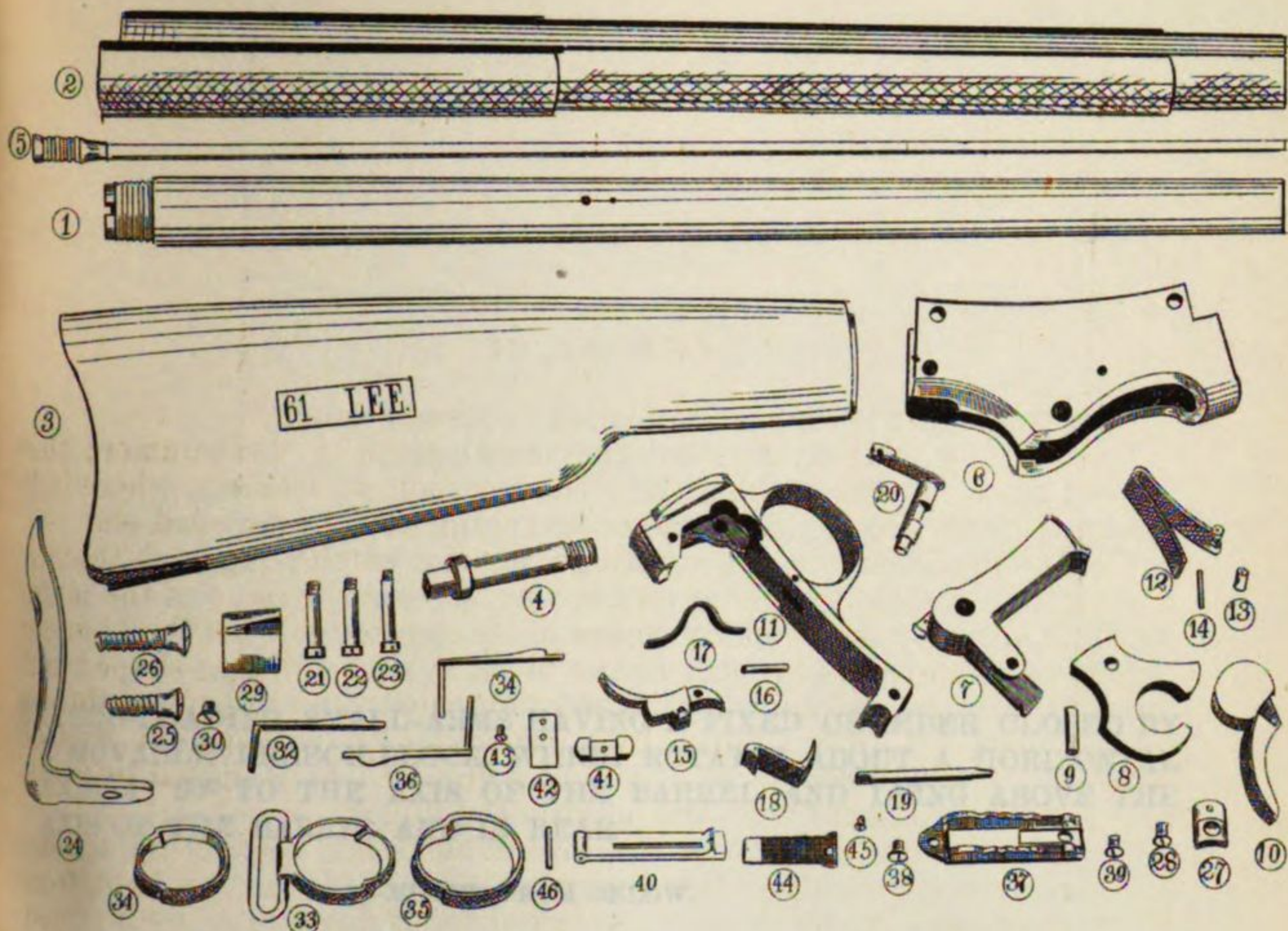
Locked.—By the position of the breech-block and its friction against the head of the cartridge when the piece is fired. It is also kept from moving forward by the lip above referred to, or downward by a projection on the sear portion of the trigger, which, when the trigger is pulled, rises to intercept the motion of the lower arm of the block.

Fired.—By a mainspring, one end of which abuts against the under side of the breech-block and the other end against the lower portion of the hammer; the leaves are pressed together by cocking the hammer.

Extraction.—By the action of the front end of the breech-block on a bent lever with varying fulcra, the first of which is on the front bolster of the guard-strap close to the point of application of the resistance, while by the continued motion of the block, the extractor is removed from this support and the—

Ejection—Is secured by the rapid rocking on the guard-strap of the curved horizontal arm of the extractor, to a point nearer and nearer the point of application of the power.

The butt-stock is counterbored for a stout iron bolt, which passing through it is screwed into the base of the frame.



25 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

EIGHT principal metallic parts not otherwise mentioned:

- 6 Frame,
- 7 Breech Block,
- 8 Hammer,
- 10 Thumb Piece,
- 11 Guard,
- 15 Trigger,

- 18 Extractor,
- 19 Firing Pin.

FIVE Screws:

- 4 Butt Stock Bolt,
- 21 Side Screw,
- 22 Side Screw,
- 23 Side Screw,
- 28 Recoil Stud Screw.

FOUR Pins:

- 9 Hammer Pin,
- 14 Main Spring Friction Roll Pin,

- 16 Trigger Pin,
- 20 Hinge Pin.

Two Springs:

- 12 Main Spring,
- 17 Trigger Spring.

FOUR other minor parts:

- 6 Hinge Pin Stop,
- 13 Main Spring Friction Roll,
- 27 Recoil Stud,
- 27 Recoil Stud Dowel Pin.

26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 5 Ramrod,
- 24 Butt Plate,
- 25 Butt Plate Screw,
- 26 Butt Plate Screw,
- 29 Tip,
- 30 Tip Screw,
- 31 Upper Band,

- 32 Upper Band Spring,
- 33 Middle Band, Swivel and Pin,
- 34 Middle Band Spring,
- 35 Lower Band,
- 36 Lower Band Spring,
- 37 Rear Sight Base,
- 38 Rear Sight Base Screw,

- 39 Rear Sight Base Screw,
- 40 Rear Sight Leaf,
- 41 Rear Sight Leaf Slide,
- 42 Rear Sight Leaf Cap,
- 43 Rear Sight Leaf Cap Ser.,
- 44 Rear Sight Spring,
- 45 Rear Sight Spring Screw,
- 46 Rear Sight Joint Pin.

LEE, No. 61.

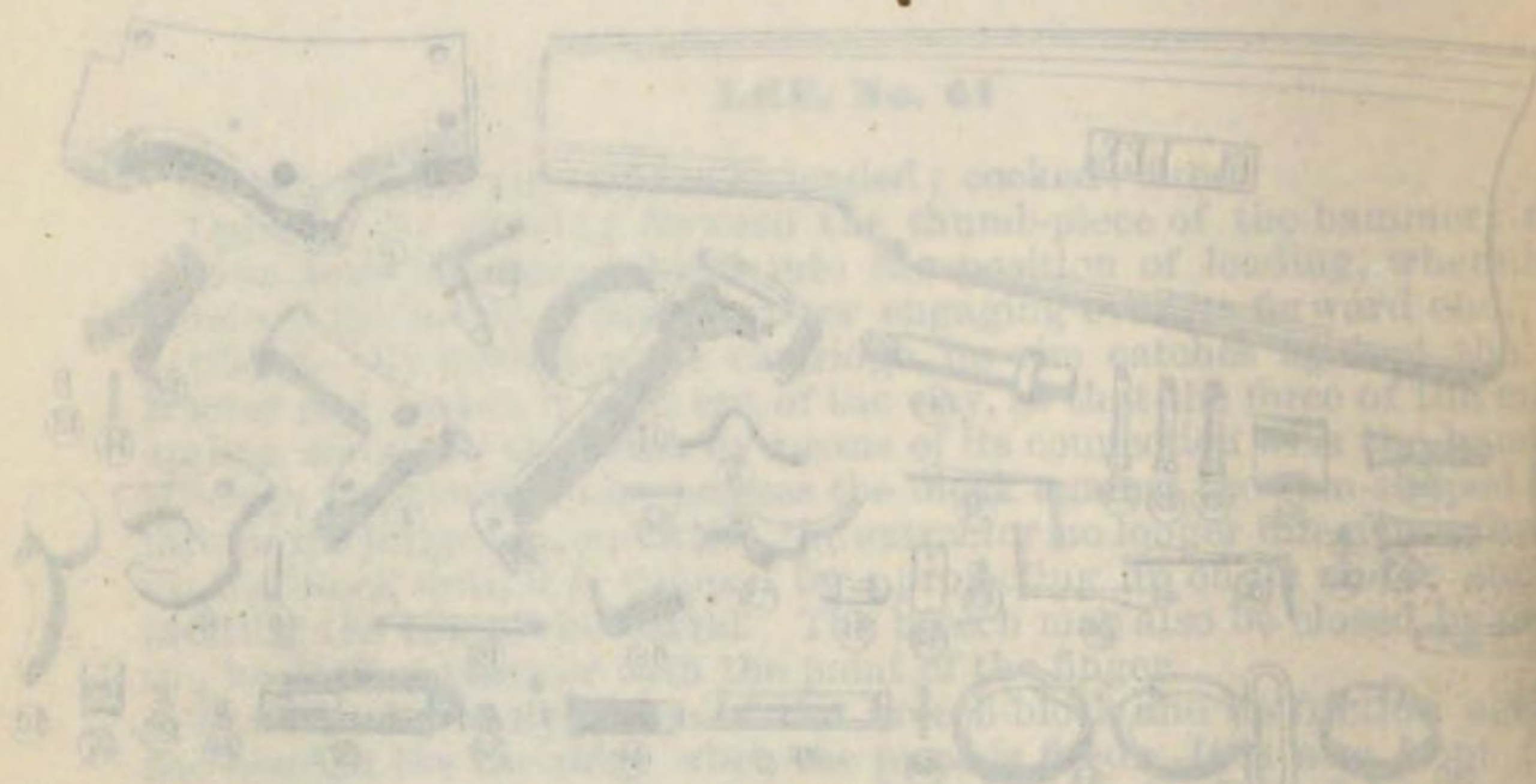
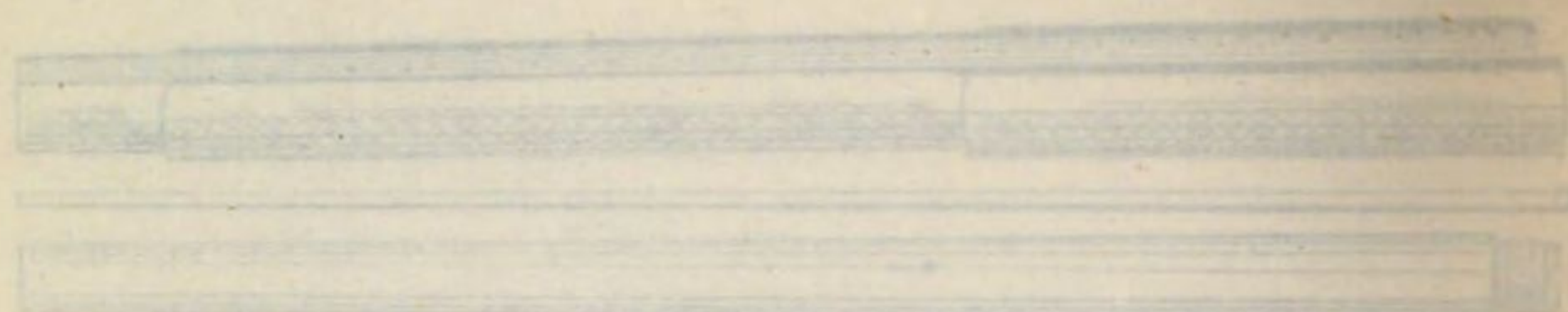


TABLE NO. 1.

LIST OF THE PARTS OF THE ENGINE, AND THE MATERIALS OF WHICH THEY ARE MADE.

NO.	PARTS NOT LISTED IN THE ABOVE LIST.	NO.	PARTS LISTED IN THE ABOVE LIST.	NO.	PARTS LISTED IN THE ABOVE LIST.
1	Iron plate for the cylinder.	11	Iron plate for the cylinder.	21	Iron plate for the cylinder.
2	Iron plate for the cylinder.	12	Iron plate for the cylinder.	22	Iron plate for the cylinder.
3	Iron plate for the cylinder.	13	Iron plate for the cylinder.	23	Iron plate for the cylinder.
4	Iron plate for the cylinder.	14	Iron plate for the cylinder.	24	Iron plate for the cylinder.
5	Iron plate for the cylinder.	15	Iron plate for the cylinder.	25	Iron plate for the cylinder.
6	Iron plate for the cylinder.	16	Iron plate for the cylinder.	26	Iron plate for the cylinder.
7	Iron plate for the cylinder.	17	Iron plate for the cylinder.	27	Iron plate for the cylinder.
8	Iron plate for the cylinder.	18	Iron plate for the cylinder.	28	Iron plate for the cylinder.
9	Iron plate for the cylinder.	19	Iron plate for the cylinder.	29	Iron plate for the cylinder.
10	Iron plate for the cylinder.	20	Iron plate for the cylinder.	30	Iron plate for the cylinder.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH ROTATES ABOUT A HORIZONTAL AXIS AT 90° TO THE AXIS OF THE BARREL, AND LYING ABOVE THE AXIS OF THE BARREL AND IN REAR—

2.—MOVED FROM BELOW.

PEABODY.

MARTINI.

WESTLEY RICHARDS.

CONROY.

PEABODY, No. 63.

Five motions, viz: Opened; loaded; closed; cocked; fired. (By special manipulation the third and fourth may be combined.)

Opened.—By depressing the guard-lever, its short arm engages in the recess of the spur beneath the breech-block and draws it down to the position of loading, in which it is maintained by the abutting of the brace-lever upon its friction-roll and pin, under the influence of the brace-lever spring.

Closed.—By reversing the action of the lever, its short arm pushes the breech-block into place, and changes the point of bearing of the brace-lever to one designed to support the breech-block in its new position, in which it is kept by the action of the brace-lever spring. By proper manipulation the hammer may be simultaneously cocked.

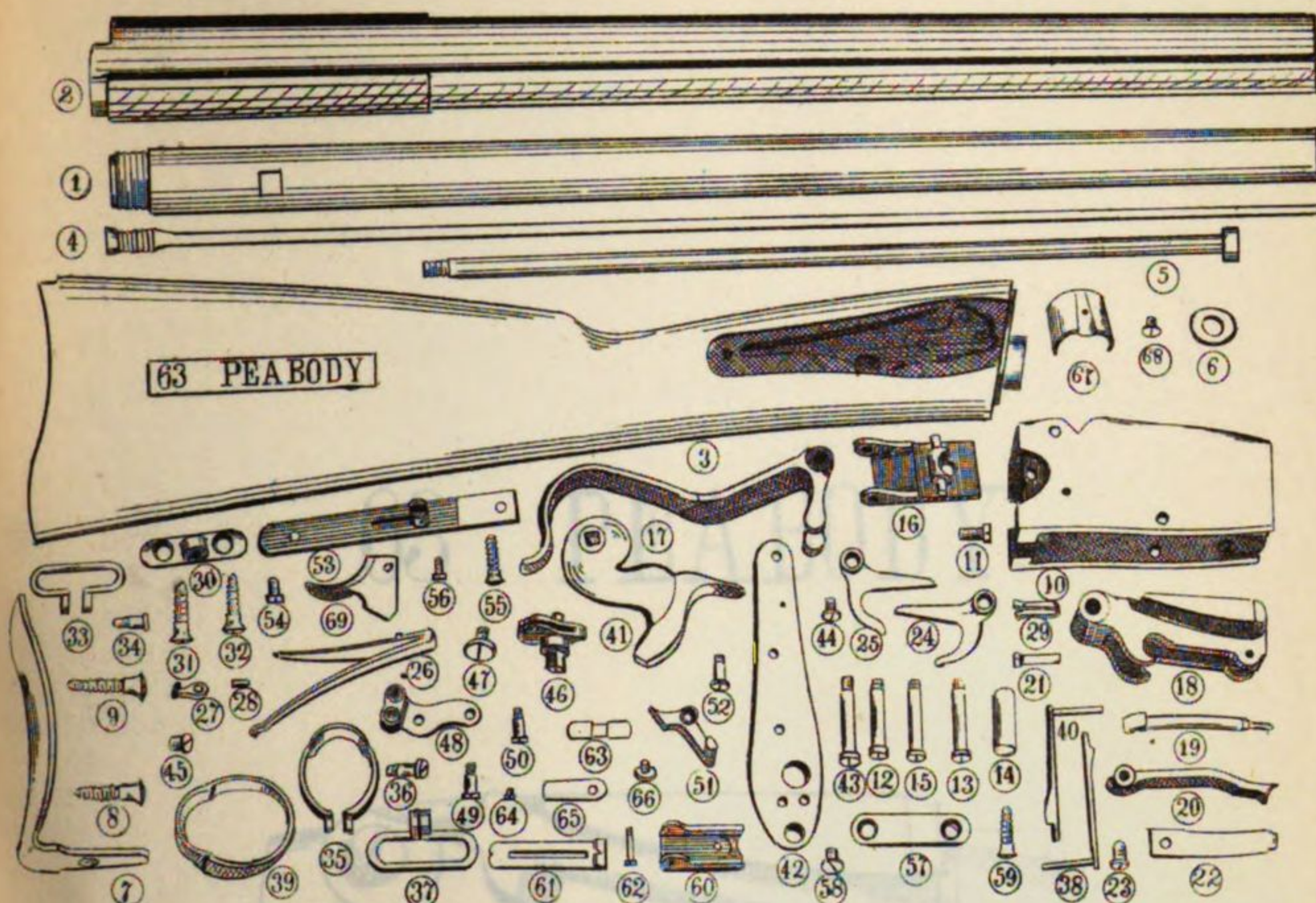
Locked.—By the position of the breech-block and its friction against the head of the cartridge when the piece is fired.

Fired.—By a back-action side-lock of the usual pattern.

Extraction.—By two bent levers pivoted below the mouth of the chamber on each side of it, and struck at the posterior extremity of their horizontal arms by the forward end of the breech-block during its descent.

Ejection.—The continued motion of the breech-block brings its points of application on the extractors nearer and nearer to their fulcra, and thereby accelerates the motion of the upper lever-arms in contact with the cartridge-shell.

The butt-stock is counterbored for a stout iron bolt, the front end of which is screwed into the back of the frame.



46 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 2 Tip Stock,
- 3 Butt Stock.

SEVENTEEN principal metallic parts not otherwise mentioned :

- 10 Frame,
- 16 Joint Strap,
- 17 Guard Lever,
- 18 Breech Block,
- 19 Firing Pin,
- 20 Brace Lever,
- 24 Right Hand Extractor,
- 25 Left Hand Extractor,
- 41 Hammer,
- 42 Lock Plate,
- 46 Tumbler,
- 48 Bridle,

- 51 Sear,
- 69 Trigger,
- 53 Trigger Plate,
- 57 Side Strap,
- 27 Main Spring Swivel.

TWENTY Screws :

- 5 Butt Stock Bolt,
- 11 Lever Joint Strap Screw,
- 12 Lever Hinge Screw,
- 13 Brace Lever Roll Screw,
- 15 Block Joint Screw,
- 21 Brace Lever Screw,
- 23 Brace Lever Spring Scr.,
- 28 Main Spring Swivel Scr.,
- 43 Lock Plate Screw,
- 44 Lock Plate Screw,
- 45 Main Spring Stop Screw,
- 47 Tumbler Screw,

- 49 Bridle Screw,
- 50 Bridle Screw,
- 52 Sear Screw,
- 54 Trigger Plate Screw,
- 55 Trigger Plate Screw,
- 56 Trigger Screw,
- 58 Butt Stock Strap Screw,
- 59 Butt Stock Strap Screw.

THREE Springs :

- 29 Firing Pin Spring,
- 22 Brace Lever Spring,
- 26 Main Spring.

FOUR other minor parts :

- 3 Side Screw Washer,
- 6 Butt Stock Bolt Washer,
- 14 Brace Lever Friction Roll,
- 1 Recoil Stud.

26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 7 Butt Plate,
- 8 Butt Plate Screw,
- 9 Butt Plate Screw,
- 35 Upper Band,
- 36 Upper Band Screw,
- 37 Upper Band Swivel,
- 38 Upper Band Spring,

- 39 Lower Band,
- 40 Lower Band Spring,
- 60 Rear Sight Base,
- 64 Rear Sight Leaf Screw,
- 61 Rear Sight Leaf,
- 63 Rear Sight Leaf Slide,
- 65 Rear Sight Spring,
- 66 Rear Sight Base Screw,
- 62 Rear Sight Joint Screw,

- 67 Tip,
- 68 Tip Screw,
- 30 Butt Stock Swivel Plate,
- 31 Butt Stock Swivel Plate Screw,
- 32 Butt Stock Swivel Plate Screw,
- 33 Butt Stock Swivel,
- 34 Butt Stock Swivel Screw.

PEABODY, No. 63.

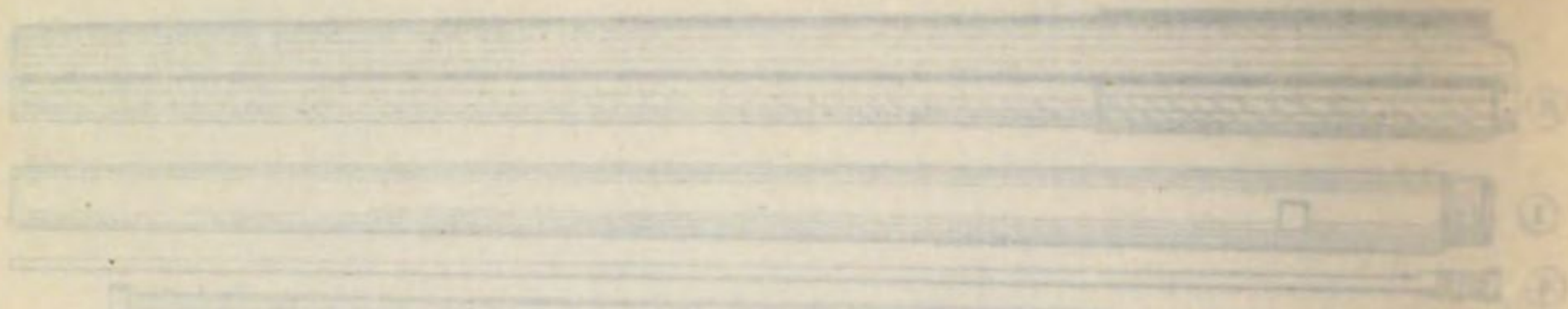


FIG. 1. PUMP BODY

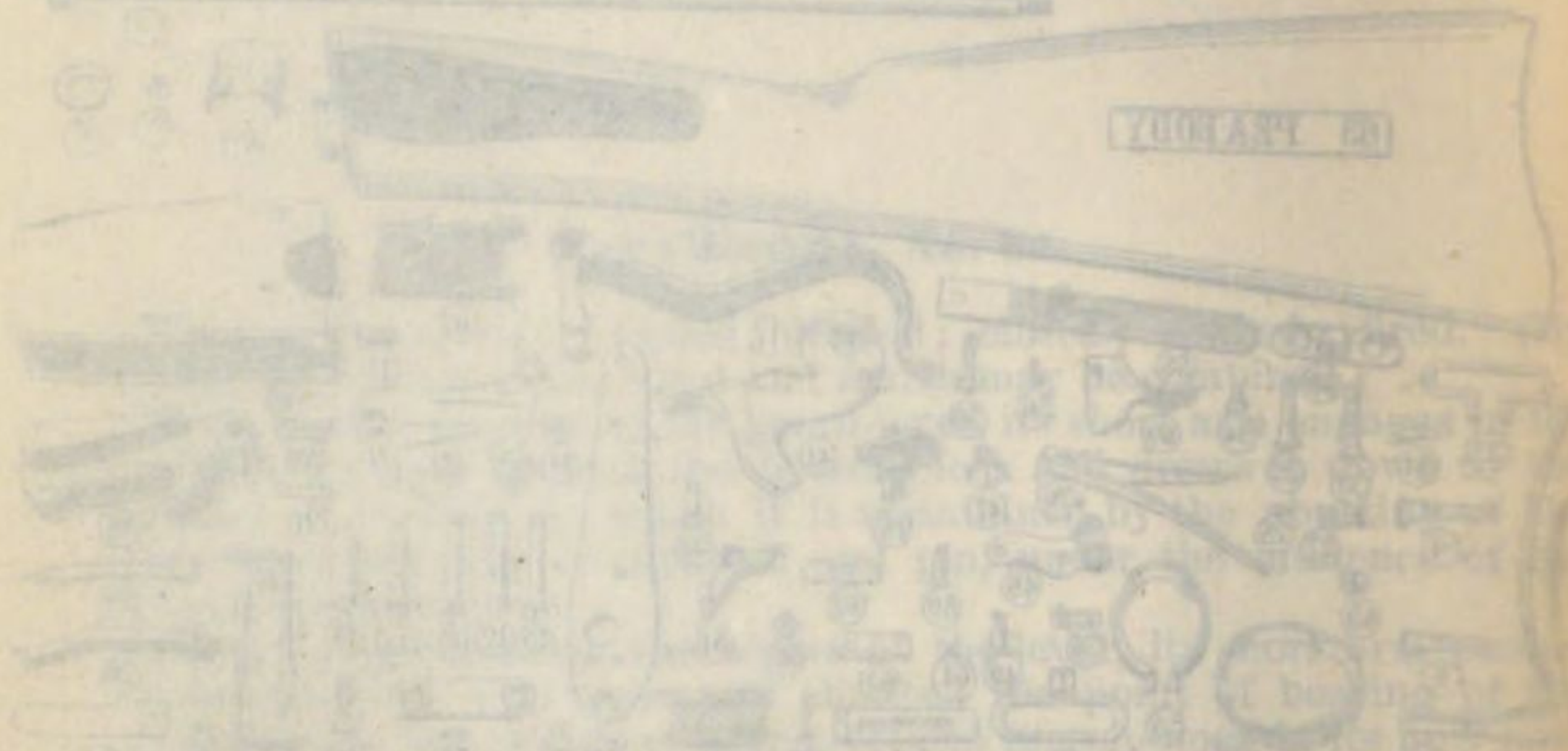


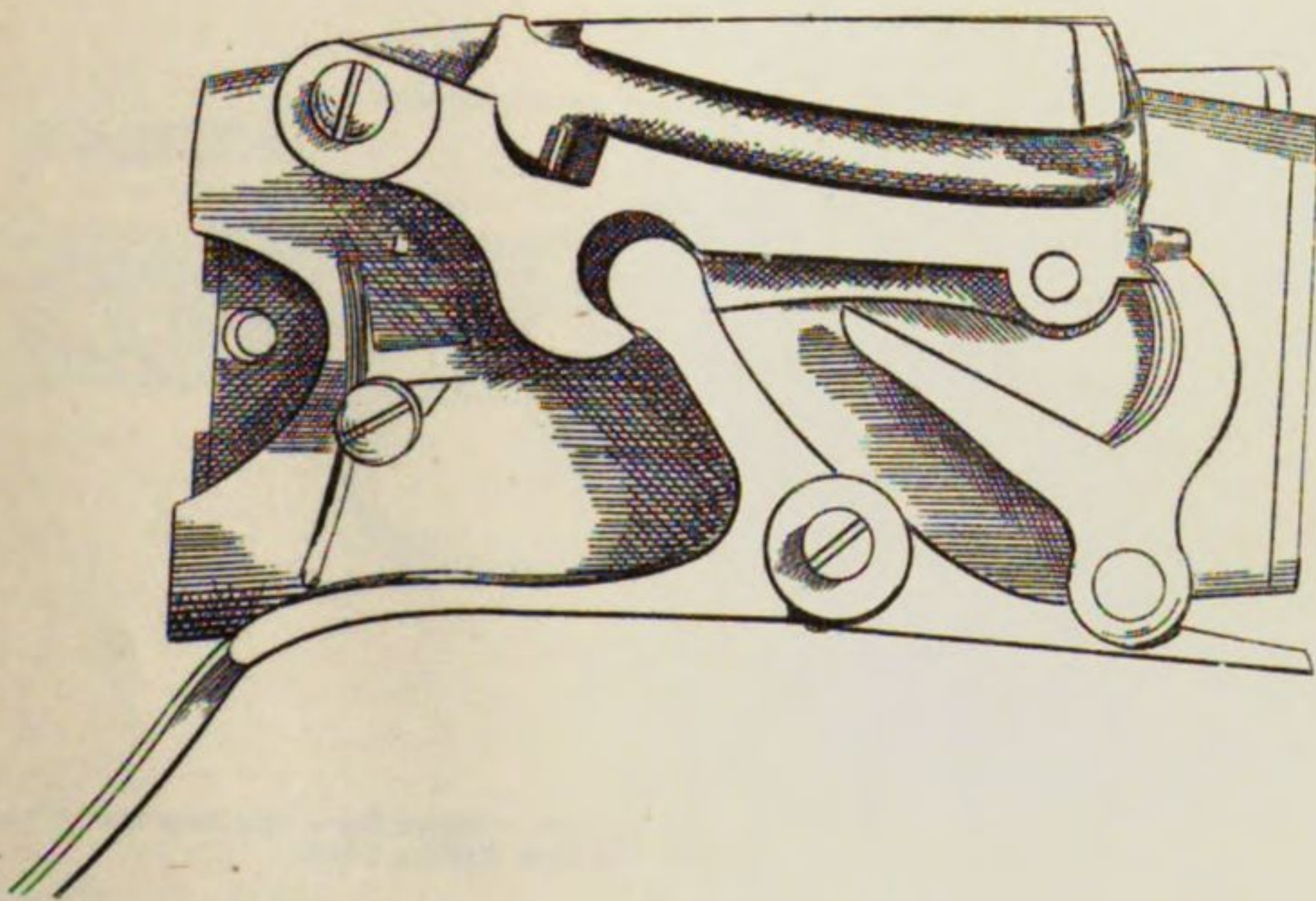
FIG. 2. PUMP BODY (continued)

1. Pump Body	2. Pump Body	3. Pump Body	4. Pump Body
5. Pump Body	6. Pump Body	7. Pump Body	8. Pump Body
9. Pump Body	10. Pump Body	11. Pump Body	12. Pump Body
13. Pump Body	14. Pump Body	15. Pump Body	16. Pump Body
17. Pump Body	18. Pump Body	19. Pump Body	20. Pump Body
21. Pump Body	22. Pump Body	23. Pump Body	24. Pump Body
25. Pump Body	26. Pump Body	27. Pump Body	28. Pump Body
29. Pump Body	30. Pump Body	31. Pump Body	32. Pump Body
33. Pump Body	34. Pump Body	35. Pump Body	36. Pump Body
37. Pump Body	38. Pump Body	39. Pump Body	40. Pump Body
41. Pump Body	42. Pump Body	43. Pump Body	44. Pump Body
45. Pump Body	46. Pump Body	47. Pump Body	48. Pump Body
49. Pump Body	50. Pump Body	51. Pump Body	52. Pump Body
53. Pump Body	54. Pump Body	55. Pump Body	56. Pump Body
57. Pump Body	58. Pump Body	59. Pump Body	60. Pump Body
61. Pump Body	62. Pump Body	63. Pump Body	64. Pump Body
65. Pump Body	66. Pump Body	67. Pump Body	68. Pump Body
69. Pump Body	70. Pump Body	71. Pump Body	72. Pump Body
73. Pump Body	74. Pump Body	75. Pump Body	76. Pump Body
77. Pump Body	78. Pump Body	79. Pump Body	80. Pump Body
81. Pump Body	82. Pump Body	83. Pump Body	84. Pump Body
85. Pump Body	86. Pump Body	87. Pump Body	88. Pump Body
89. Pump Body	90. Pump Body	91. Pump Body	92. Pump Body
93. Pump Body	94. Pump Body	95. Pump Body	96. Pump Body
97. Pump Body	98. Pump Body	99. Pump Body	100. Pump Body

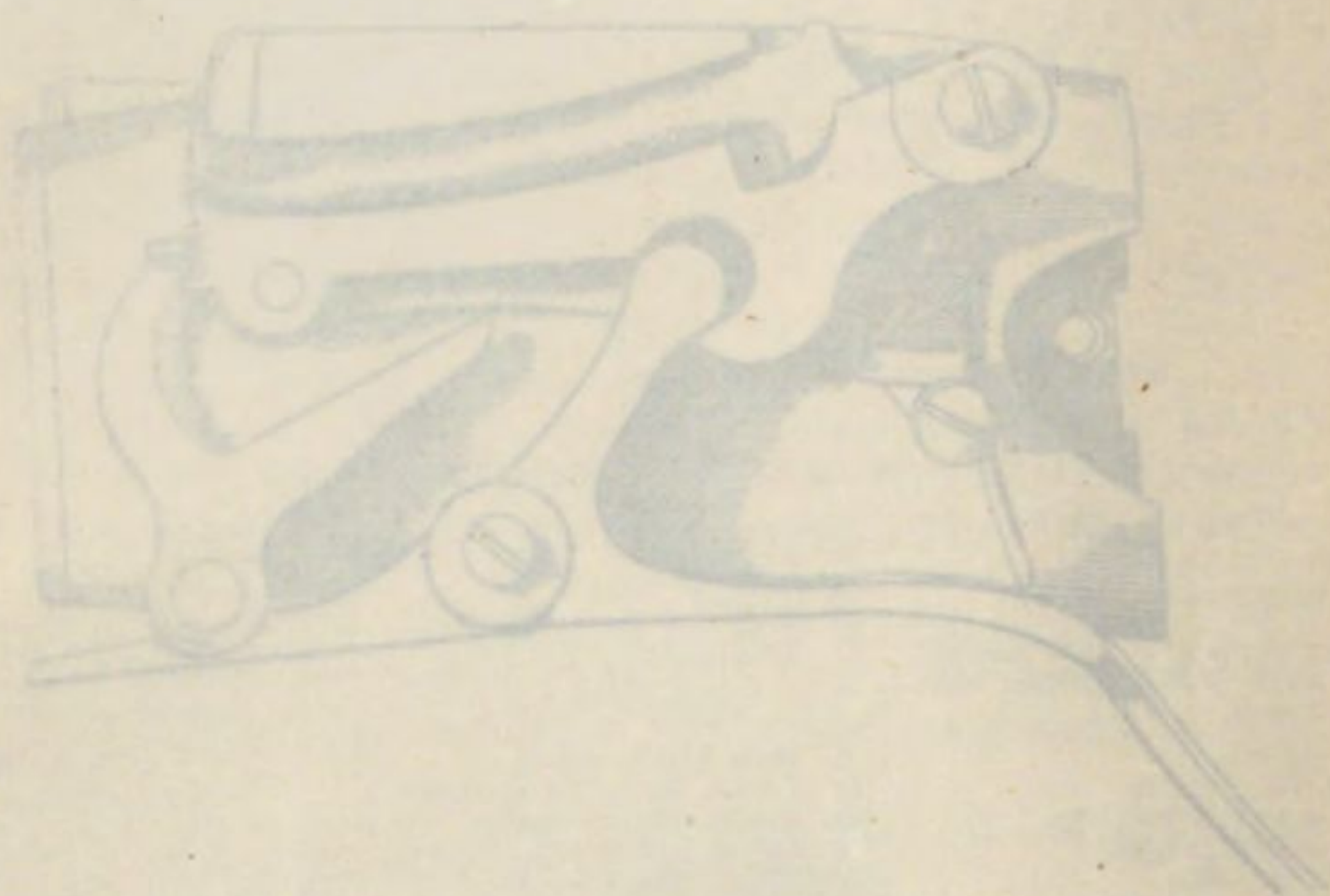
1. Pump Body	2. Pump Body	3. Pump Body	4. Pump Body
5. Pump Body	6. Pump Body	7. Pump Body	8. Pump Body
9. Pump Body	10. Pump Body	11. Pump Body	12. Pump Body
13. Pump Body	14. Pump Body	15. Pump Body	16. Pump Body
17. Pump Body	18. Pump Body	19. Pump Body	20. Pump Body
21. Pump Body	22. Pump Body	23. Pump Body	24. Pump Body
25. Pump Body	26. Pump Body	27. Pump Body	28. Pump Body
29. Pump Body	30. Pump Body	31. Pump Body	32. Pump Body
33. Pump Body	34. Pump Body	35. Pump Body	36. Pump Body
37. Pump Body	38. Pump Body	39. Pump Body	40. Pump Body
41. Pump Body	42. Pump Body	43. Pump Body	44. Pump Body
45. Pump Body	46. Pump Body	47. Pump Body	48. Pump Body
49. Pump Body	50. Pump Body	51. Pump Body	52. Pump Body
53. Pump Body	54. Pump Body	55. Pump Body	56. Pump Body
57. Pump Body	58. Pump Body	59. Pump Body	60. Pump Body
61. Pump Body	62. Pump Body	63. Pump Body	64. Pump Body
65. Pump Body	66. Pump Body	67. Pump Body	68. Pump Body
69. Pump Body	70. Pump Body	71. Pump Body	72. Pump Body
73. Pump Body	74. Pump Body	75. Pump Body	76. Pump Body
77. Pump Body	78. Pump Body	79. Pump Body	80. Pump Body
81. Pump Body	82. Pump Body	83. Pump Body	84. Pump Body
85. Pump Body	86. Pump Body	87. Pump Body	88. Pump Body
89. Pump Body	90. Pump Body	91. Pump Body	92. Pump Body
93. Pump Body	94. Pump Body	95. Pump Body	96. Pump Body
97. Pump Body	98. Pump Body	99. Pump Body	100. Pump Body

FIG. 3. PUMP BODY

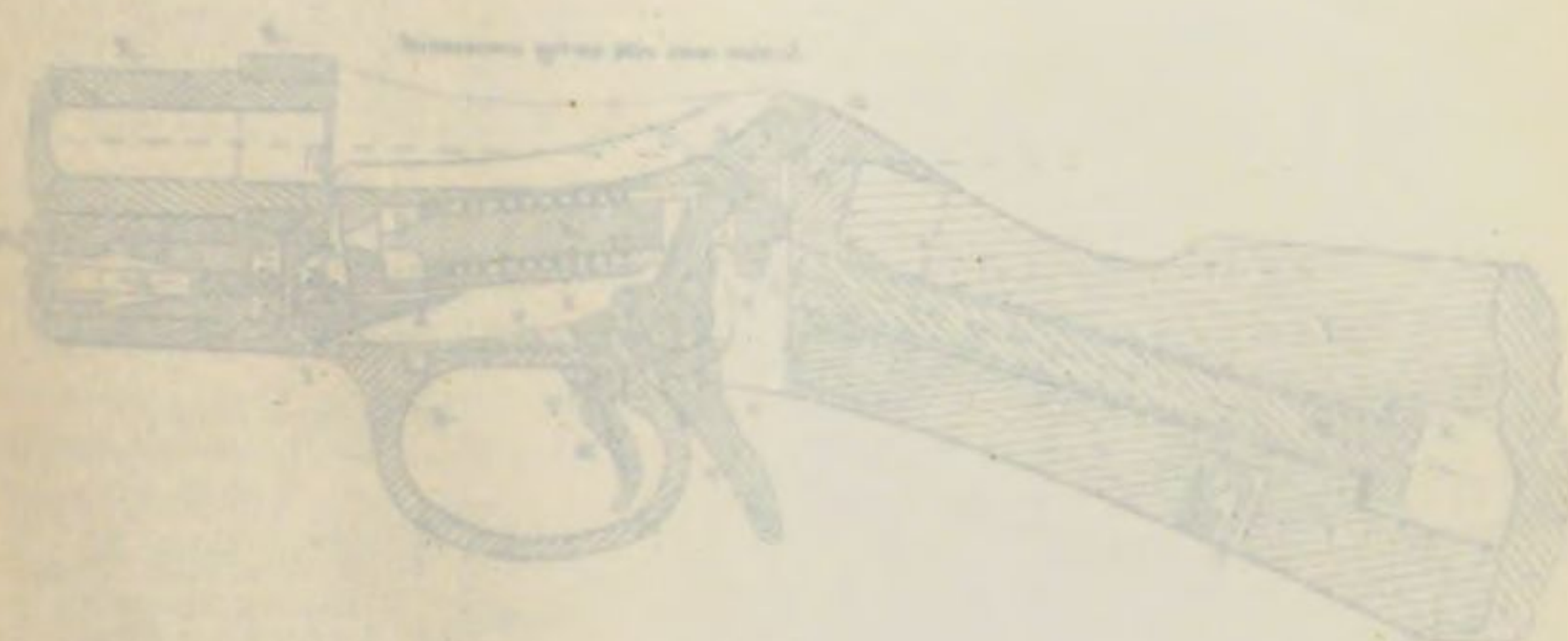
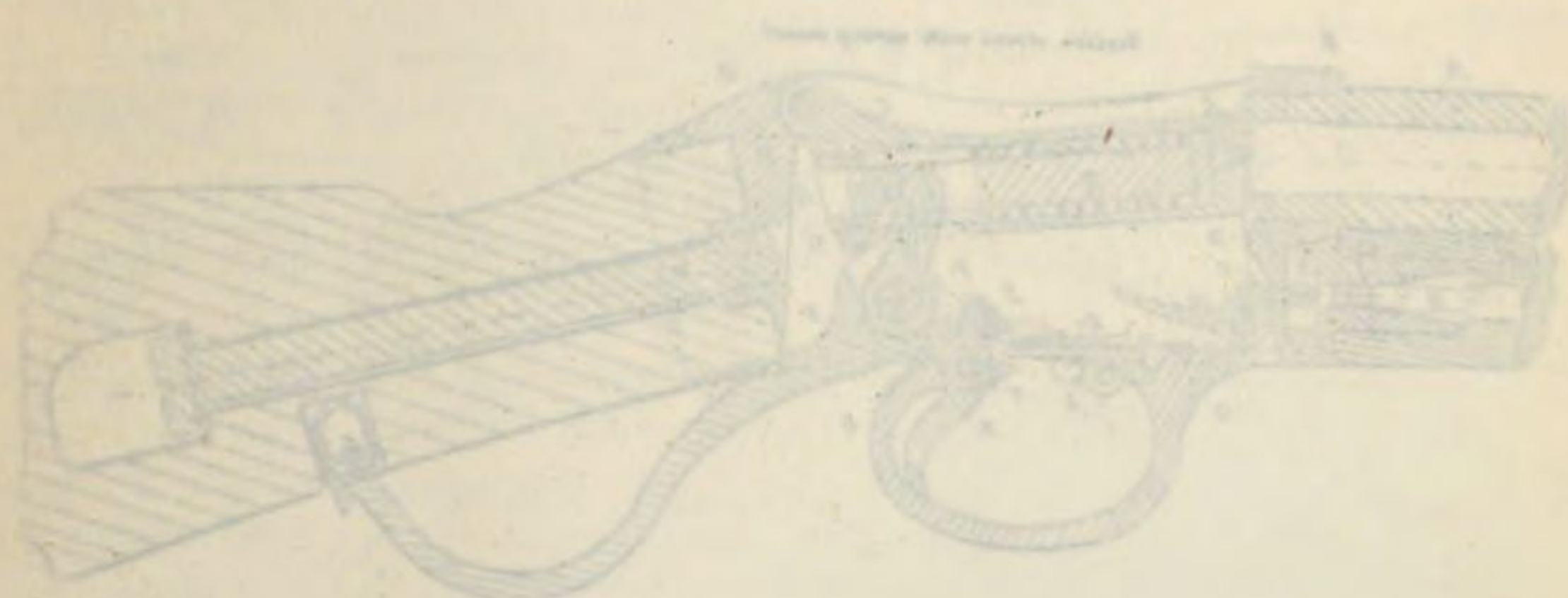
63 PEABODY.



63 PEABODY.



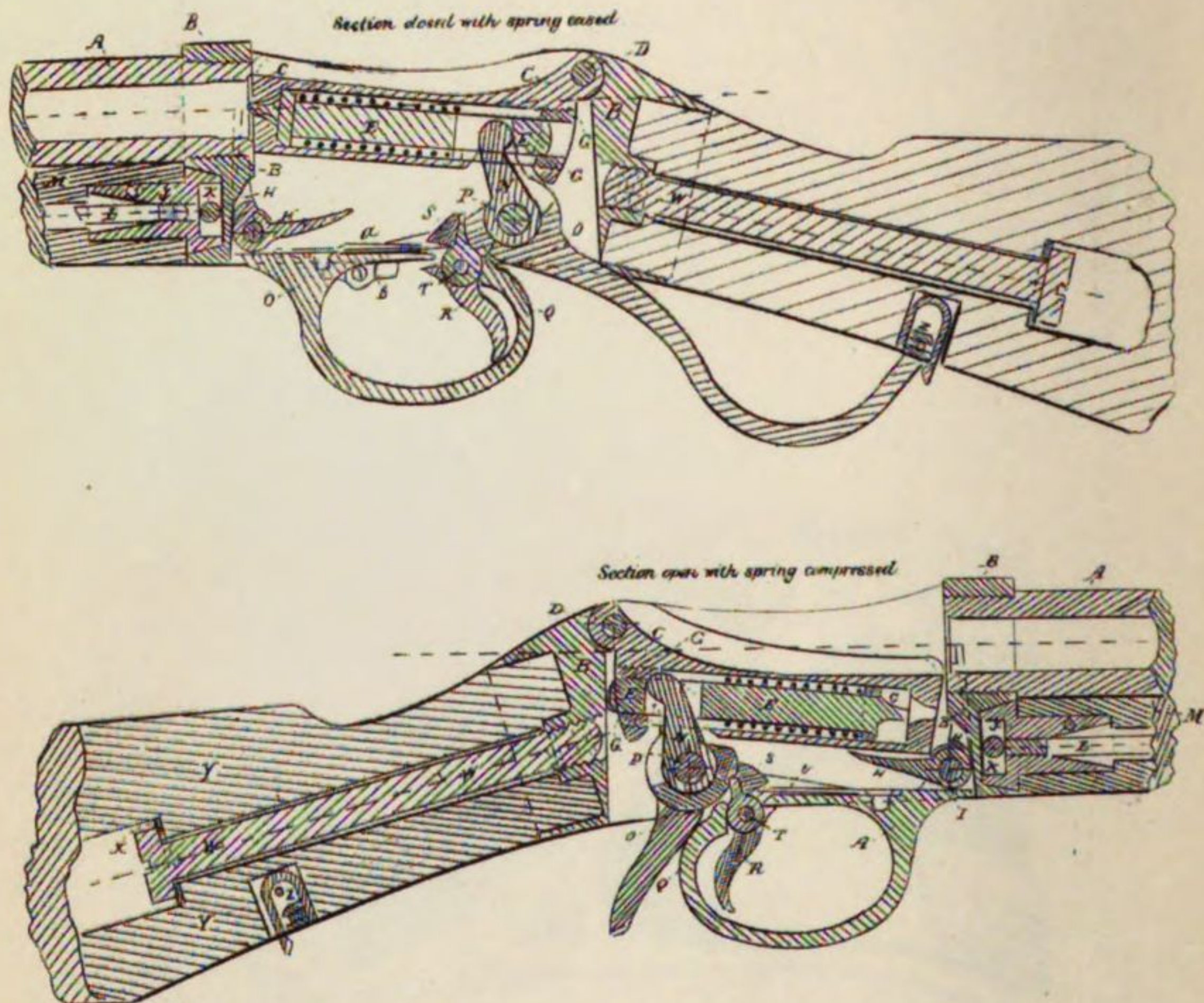
MARTINI SYSTEM.



Figures 1 and 2. Martini-Henry System. Taken from the Reports of the Committee on the Ordnance of the House of Representatives, 1887.

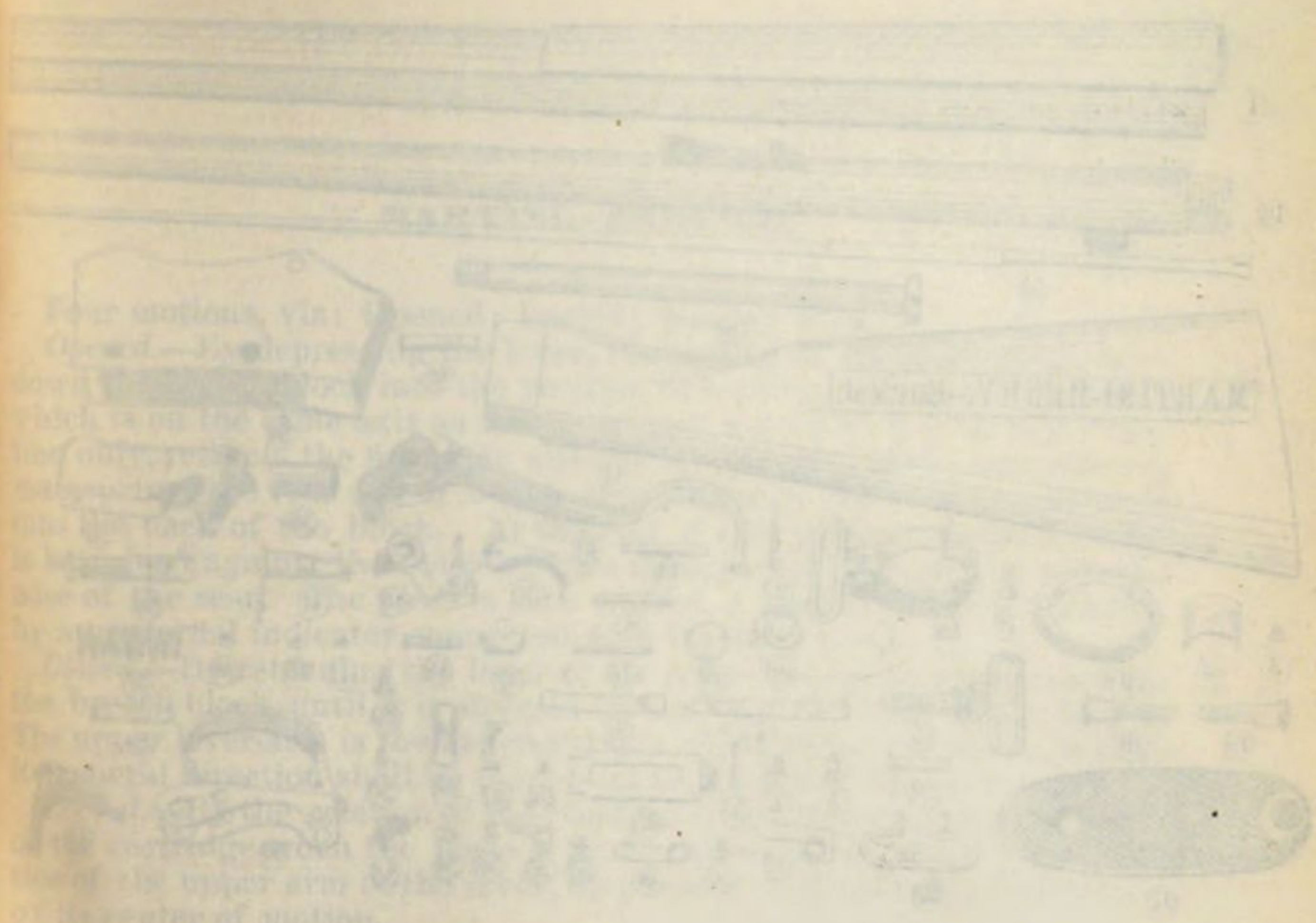
A. Barrel.	K. Bolt and Bolt Holder.	T. Trigger and Bolt Axis Pin.
B. Bolt.	L. Hammer.	U. Trigger and Bolt Spring.
C. Block.	M. Bolt, Bolt Head.	V. Stock Bolt.
D. Bolt Axis Pin.	N. Trigger.	W. Stock Bolt.
E. Slightly too long.	O. Lever.	X. Stock Bolt Washer.
F. Slightly too short.	P. Lever and Trigger Axis.	Y. Lever Catch Bolt Spring.
G. Main Spring.	Q. Trigger Plate and Guard.	Z. Locking Bolt.
H. Spring.	R. Trigger.	A. Trigger Piece.
I. Extension Axis Pin.	S. Trigger Bolt.	
J. Bolt and Bolt Holder.		

“ MARTINI ” SYSTEM.

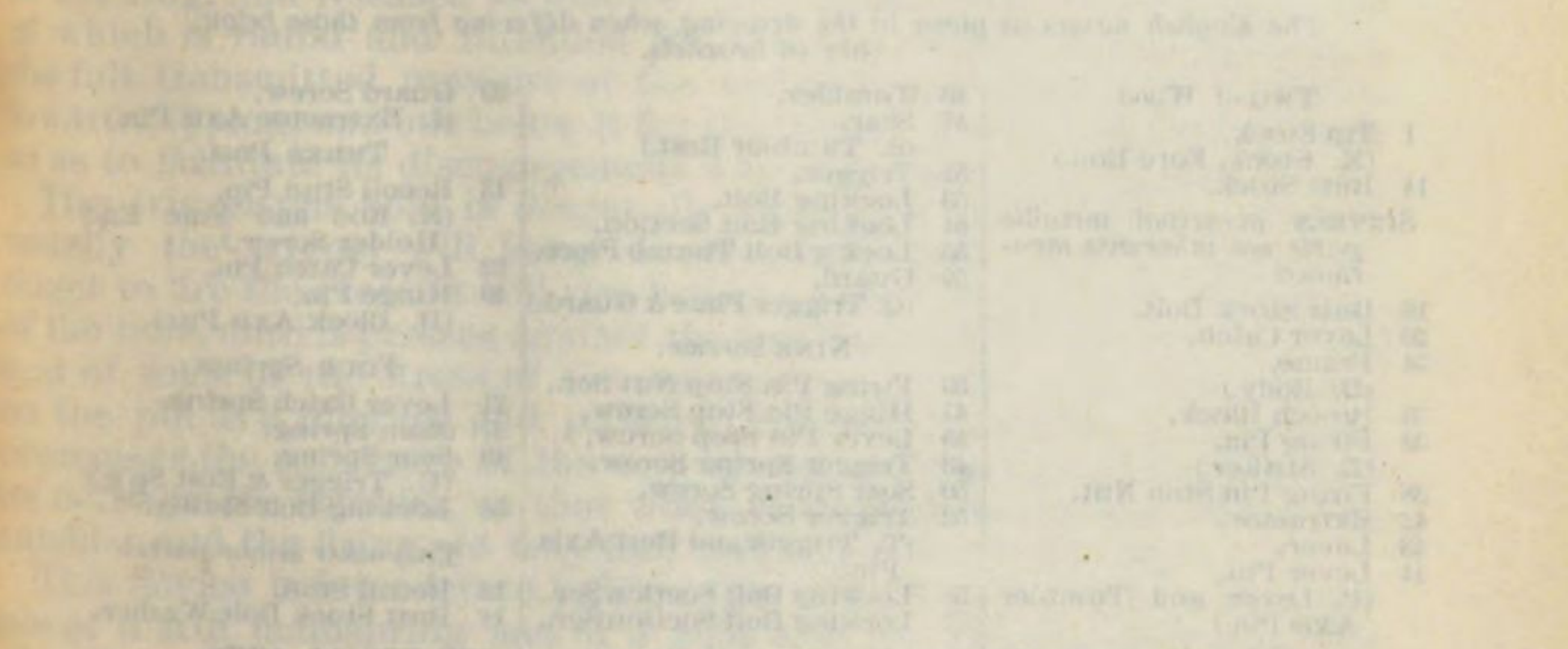


Sections and Names of Components,—“ Martini ” System,—taken from the Reports of the (British) Committee on Breech Loading Rifles. 1869.

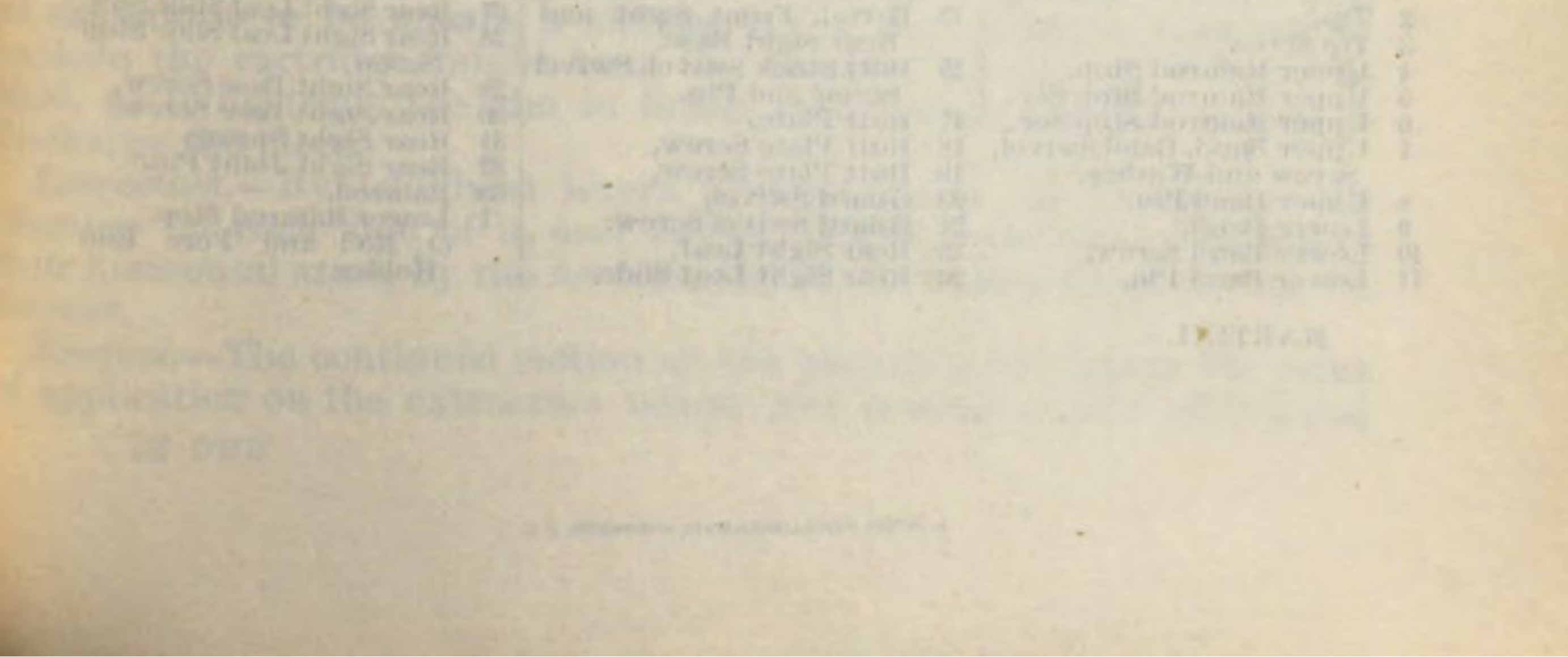
A A. Barrel.	K. Rod and Fore End Holder	T. Trigger and Rest Axis Pin.
B B. Body.	L. Ramrod.	U. Trigger and Rest Spring.
C C. Block.	M. Stock, Fore End.	V. Stock Butt.
D. Block Axis Pin. (Shown slightly too low.)	N. Tumbler.	W. Stock Bolt.
E. Striker.	O. Lever.	X. Stock Bolt Washer.
F. Main Spring.	P. Lever and Tumbler Axis Pin.	Z. Lever Catch Block Spring and Pin.
G. Stop Nut.	Q. Trigger Plate and Guard.	a. Locking Bolt.
H. Extractor.	R. Trigger.	b. Thumb Piece.
I. Extractor Axis Pin.	S. Tumbler Rest.	
J. Rod and Fore End Holder.		

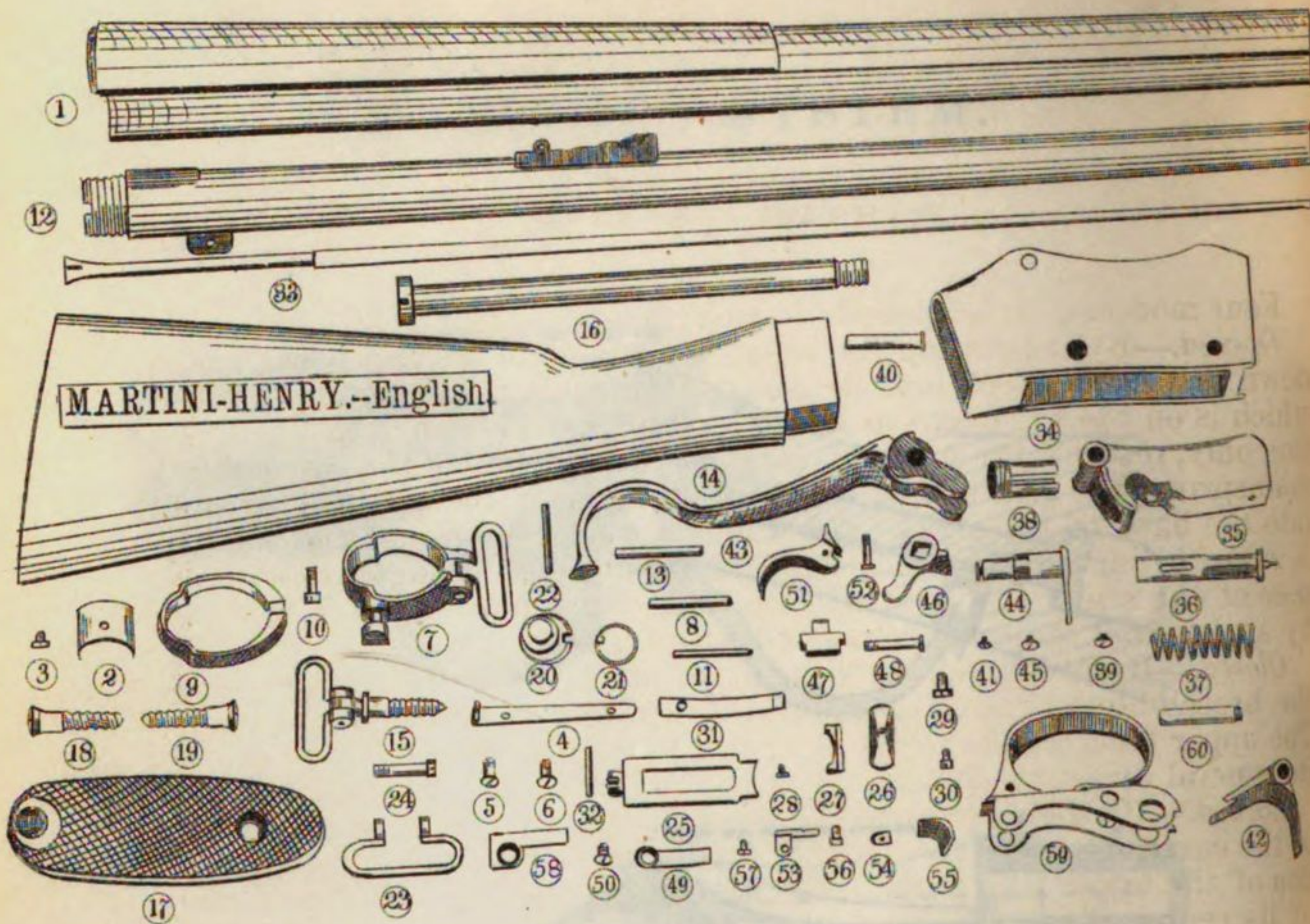


SECTIONAL ELEVATION AND EXTERIOR TO THE RIGHT



SECTIONAL ELEVATION AND EXTERIOR TO THE LEFT





36 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

The English names as given in the drawing, when differing from those below, are in brackets.

- | | | |
|---|-----------------------------|--|
| Two of Wood : | | |
| 1 | Tip Stock, | |
| | (M. Stock, Fore End.) | |
| 14 | Butt Stock. | |
| SIXTEEN principal metallic parts not otherwise mentioned : | | |
| 16 | Butt Stock Bolt, | |
| 20 | Lever Catch, | |
| 34 | Frame, | |
| | (B. Body.) | |
| 35 | Breech Block, | |
| 36 | Firing Pin, | |
| | (E. Striker.) | |
| 38 | Firing Pin Stop Nut, | |
| 42 | Extractor, | |
| 43 | Lever, | |
| 44 | Lever Pin, | |
| | (P. Lever and Tumbler | |
| | Axis Pin.) | |
| 46 | Tumbler, | |
| 47 | Sear, | |
| | (S. Tumbler Rest.) | |
| 51 | Trigger, | |
| 53 | Locking Bolt, | |
| 54 | Locking Bolt Section, | |
| 55 | Lock'g Bolt Thumb Piece, | |
| 59 | Guard, | |
| | (Q. Trigger Plate & Guard.) | |
| NINE Screws : | | |
| 39 | Firing Pin Stop Nut Ser., | |
| 41 | Hinge Pin Stop Screw, | |
| 45 | Lever Pin Stop Screw, | |
| 48 | Trigger Spring Screw, | |
| 50 | Sear Spring Screw, | |
| 52 | Trigger Screw, | |
| | (T. Trigger and Rest Axis | |
| | Pin.) | |
| 56 | Locking Bolt Section Ser., | |
| 57 | Locking Bolt Section Ser., | |
| 60 | Guard Screw, | |
| | (I. Extractor Axis Pin.) | |
| THREE Pins : | | |
| 13 | Recoil Stud Pin, | |
| | (K. Rod and Fore End | |
| | Holder Screw.) | |
| 22 | Lever Catch Pin, | |
| 40 | Hinge Pin, | |
| | (D. Block Axis Pin.) | |
| FOUR Springs : | | |
| 21 | Lever Catch Spring, | |
| 37 | Main Spring, | |
| 49 | Sear Spring, | |
| | (U. Trigger & Rest Sp'g.) | |
| 58 | Locking Bolt Spring. | |
| Two other minor parts : | | |
| 12 | Recoil Stud, | |
| 14 | Butt Stock Bolt Washer. | |

34 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- | | | | | | |
|----|--------------------------|----|---------------------------|----|-----------------------------|
| 2 | Tip, | 12 | Barrel, Front Sight and | 27 | Rear Sight Leaf Slide Stop, |
| 3 | Tip Screw, | | Rear Sight Base, | 28 | Rear Sight Leaf Slide Stop |
| 4 | Upper Ramrod Stop, | 15 | Butt Stock Swivel, Swivel | | Screw, |
| 5 | Upper Ramrod Stop Ser., | | Screw and Pin, | 29 | Rear Sight Base Screw, |
| 6 | Upper Ramrod Stop Ser., | 17 | Butt Plate, | 30 | Rear Sight Base Screw, |
| 7 | Upper Band, Band Swivel, | 18 | Butt Plate Screw, | 31 | Rear Sight Spring, |
| | Screw and Washer, | 19 | Butt Plate Screw, | 32 | Rear Sight Joint Pin, |
| 8 | Upper Band Pin, | 23 | Guard Swivel, | 33 | Ramrod, |
| 9 | Lower Band, | 24 | Guard Swivel Screw, | 1 | Lower Ramrod Stop. |
| 10 | Lower Band Screw, | 25 | Rear Sight Leaf, | | (J. Rod and Fore End |
| 11 | Lower Band Pin, | 26 | Rear Sight Leaf Slide, | | Holder.) |

MARTINI.

MARTINI.—ENGLISH.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By depressing the lever, the motion of its upper arm draws down the breech-block into the position of loading, and by the tumbler, which is on the same axis as the lever and moves with it in this direction only, retracts the firing-pin against the pressure of the surrounding mainspring, the rear end of which abuts against the stop-nut screwed into the back of the block. At the end of the movement the tumbler is sustained against the tension of the mainspring by engaging with the nose of the sear. The piece is then cocked, a condition which is shown by an external indicator connected with the lever-pin.

Closed.—By returning the lever to its place the upper arm pushes up the breech-block until it is stopped by striking the face of the barrel. The upper lever-arm is then engaged in a notch under the block, so that its general direction shall be tangential to the arc of opening.

Locked.—By the position of the block and its friction against the head of the cartridge when the piece is fired. It is also braced by the position of the upper arm of the lever, its point of contact being in advance of its center of motion.

Fired.—By the action of the spiral mainspring, compressed in the act of opening, and released as follows: The tumbler has two notches, one of which is radial and intended for the sear, which may thus sustain the full transmitted pressure of the mainspring without any tendency toward slipping, and one below it for the trigger, sloping slightly upward so as to facilitate its disengagement when the piece is to be fired.

The trigger-pin hole is diagonally elongated and enlarged, so that usually the trigger will hang loosely, but when pressed with the finger to fire the piece, it will rise bodily on the pin along the elongation of the hole, until it presses against the tumbler sufficiently to relieve the sear of some of the stress of the mainspring; at the same time it turns on the pin as a fulcrum, and pressing against a shoulder on the sear, overcomes the resistance of the sear-spring, and pushes the sear out of its notch in the tumbler, so that when released from its own notch, the tumbler and the firing-pin may fall, and so discharge the piece.

This device is intended to lighten the pull-off, and yet to permit the use of a stiff mainspring and of a safe rest for the tumbler when the piece is cocked. Otherwise, unless the notch in the tumbler were made so shallow as to be unsafe, a mainspring of the strength required to explode the cartridge, might bear the tumbler against the trigger so hard, as to unsteady the aim in firing, from the great force needed to discharge the piece.

Extraction.—By two bent levers pivoted below the mouth of the chamber on each side of it, and struck at the posterior extremity of their horizontal arms, by the forward end of the breech-block during its descent.

Ejection.—The continued motion of the breech-block brings its point of application on the extractors nearer and nearer to their fulcra, and

thereby accelerates the motion of the upper lever-arms in contact with the cartridge-shell.

Half-cocked.—A safety-catch, consisting of a slide and external thumb-piece moved backward to block the sear, is intended to replace the ordinary half-cock notch.

The butt-stock is counterbored for a stout iron bolt which is screwed into the back of the frame.

Note.—This system, when wedded to the barrel and ammunition proposed by Mr. Henry, constitutes the Martini-Henry rifle.

WESTLEY RICHARDS, No. 46.

(Withdrawn before being photographed.)

In its general features this arm resembles the Martini, having however the lever separate from and pivoted in front of the guard, and by its movement in opening cocking a true hammer lying concealed beneath the block, and impelled by a flat mainspring placed below the barrel. The blow of the hammer is directly delivered upon the cartridge, a groove for its movement being cut in the under side of the breech-block. The usual extractor in guns of this class is employed.

CONROY, No. 84.

Withdrawn before being photographed or examined with sufficient closeness for an accurate description.

Five motions, viz: Opened; loaded; closed; full-cocked; fired.

Opened.—The arm as first presented was provided with a falling breech-block, moved by a sliding trigger-guard, the withdrawal of which retracted the firing-pin, brought the hammer to the half-cock, and dropped the block, which struck in its descent and operated the usual bent-lever extractor.

Closed.—By pushing the trigger-guard forward again the block was raised, when by bringing the hammer to the full-cock the piece could be fired.

Fired.—The blow of the hammer was not delivered directly upon the firing-pin, but on an intermediate lever pivoted below its point of impact on the firing-pin, and striking it so as to impel it forward in the line of the axis of the bore.

This gun was again presented, after having been altered by substituting for the sliding-guard the more powerful motor found in the usual swinging guard-lever, the angle formed by which with the stock when the piece was opened was of about 30°.

BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH ROTATES ABOUT A HORIZONTAL AXIS AT 90° TO THE AXIS OF THE BARREL, LYING BELOW THE AXIS OF THE BARREL AND IN FRONT.

2.—MOVED FROM ABOVE BY A THUMB-PIECE.

REMINGTON.

REMINGTON-LOCKING, *including*

THOMAS.

REMINGTON-RYDER.

WHITNEY.

DEXTER.

WHITTEMORE.

MUIR-MONT-STORM, No. 60.

UPDEGRAFF.

NOTE.—The application of the firing-pin retractor to arms of this type, is intended to prevent the accidental explosion of the cartridge in the act of closing the piece.

In some of these systems, accident from this cause is still further guarded against, by the temporary locking of the breech by the hammer or locking-brace at the moment that it is closed.

SPANISH-REMINGTON, No. 41.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Essentially the same system as the Remington experimental, model 1870, and the Remington navy-rifle.

Opened.—By bringing the hammer to a full-cock, and then swinging back the breech-block by its projecting thumb-piece.

Closed.—By bringing back the breech-block to its original position, the locking-lever locking fast the sear during the opening of the piece, and thus keeping the hammer from accidentally following up the movement of the block.

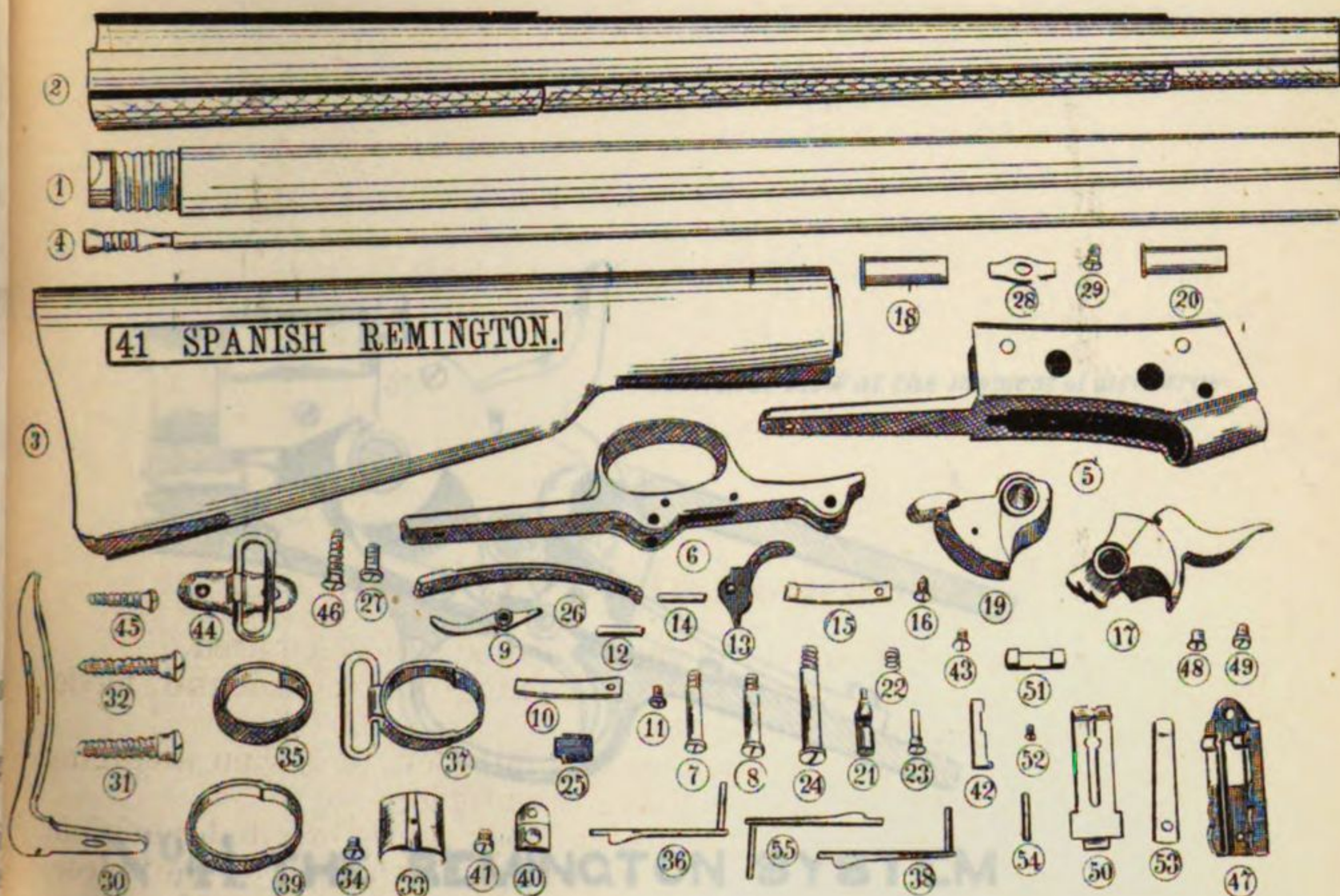
Locked.—By the descent of the hammer under the breech-block when the piece is fired.

Fired.—By a center-lock of the usual pattern.

Extraction.—By a sliding extractor on the left side of the barrel, moved by a shoulder on the hub of the breech-block.

Ejection.—By accelerating the movement of the breech-block with the hand in opening the piece.

Note.—The Remington experimental model, 1870, was one of those issued for comparative trial in the field.



32 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 2 Tip Stock,
- 3 Butt Stock.

EIGHT principal metallic parts not otherwise mentioned :

- 5 Frame,
- 17 Hammer,
- 19 Breech Block,
- 21 Firing Pin,
- 6 Guard,
- 9 Locking Lever,
- 13 Trigger,
- 42 Extractor.

TEN Screws :

- 23 Firing Pin Spring Screw,
- 7 Guard Screw,
- 8 Guard Screw,
- 11 Friction Lever Spr'g Scr.,
- 16 Sear Spring Screw,
- 27 Main Spring Screw,
- 29 Button Screw,
- 43 Extractor Screw,
- 24 Tang Screw,
- 41 Recoil Stud Screw.

FIVE Pins :

- 5 Main Spring Stop Pin,

- 18 Hammer Pin,
- 20 Breech Block Pin,
- 12 Friction Lever Pin,
- 14 Trigger Pin.

FOUR Springs :

- 22 Firing Pin Spring,
- 10 Friction Lever Spring,
- 15 Sear Spring,
- 26 Main Spring.

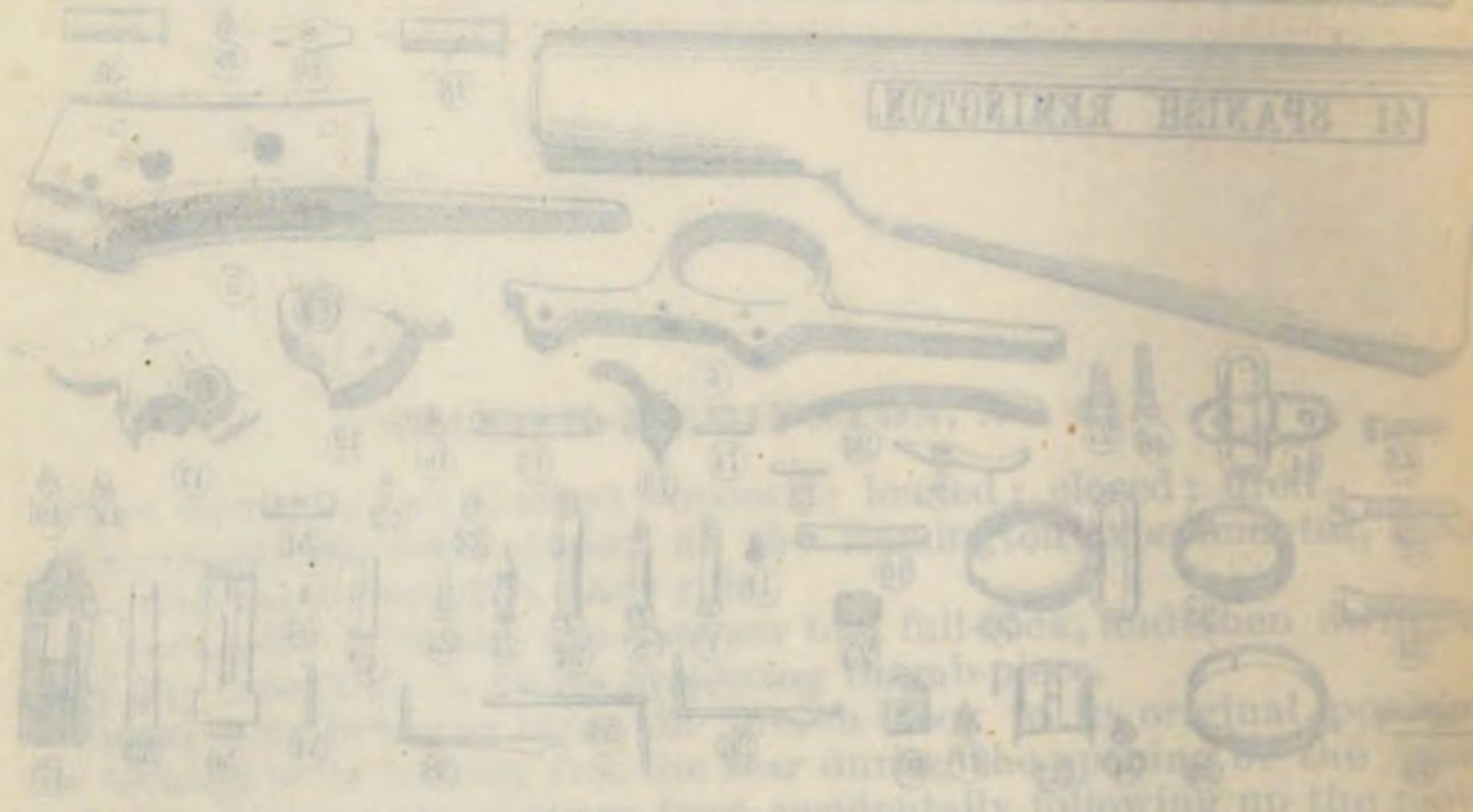
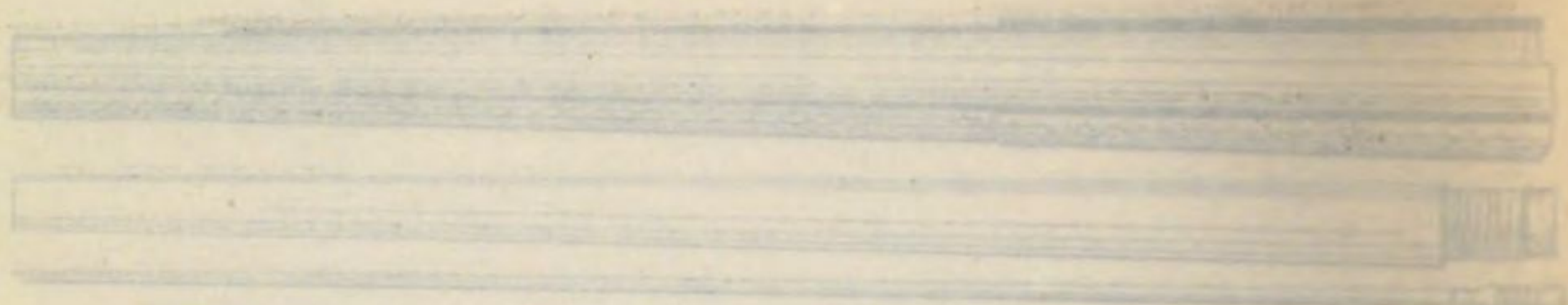
THREE other minor parts :

- 28 Button,
- 40 Recoil Stud,
- 40 Recoil Stud Dowel Pin.

30 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- | | | |
|---------------------------|----------------------------|-----------------------------|
| 1 Barrel and Front Sight, | 30 Butt Plate, | 39 Lower Band, |
| 4 Ramrod, | 31 Butt Plate Screw, | 55 Lower Band Spring, |
| 47 Rear Sight Base, | 32 Butt Plate Screw, | 25 Ramrod Stop, |
| 48 Rear Sight Base Screw, | 33 Tip, | 44 Butt Stock Swivel Plate, |
| 49 Rear Sight Base Screw, | 34 Tip Screw, | Swivel and Pin, |
| 50 Rear Sight Leaf, | 35 Upper Band, | 45 Butt Stock Swivel Plate |
| 51 Rear Sight Leaf Slide, | 36 Upper Band Spring, | Screw, |
| 52 Rear Sight Leaf Screw, | 37 Middle Band, Swivel and | 46 Butt Stock Swivel Plate |
| 53 Rear Sight Spring, | Pin, | Screw. |
| 54 Rear Sight Joint Pin, | 38 Middle Band Spring, | |

SPANISH REMINGTON, No. 41.



Two of Wood: Should be kept in mind and essential to the rifle.

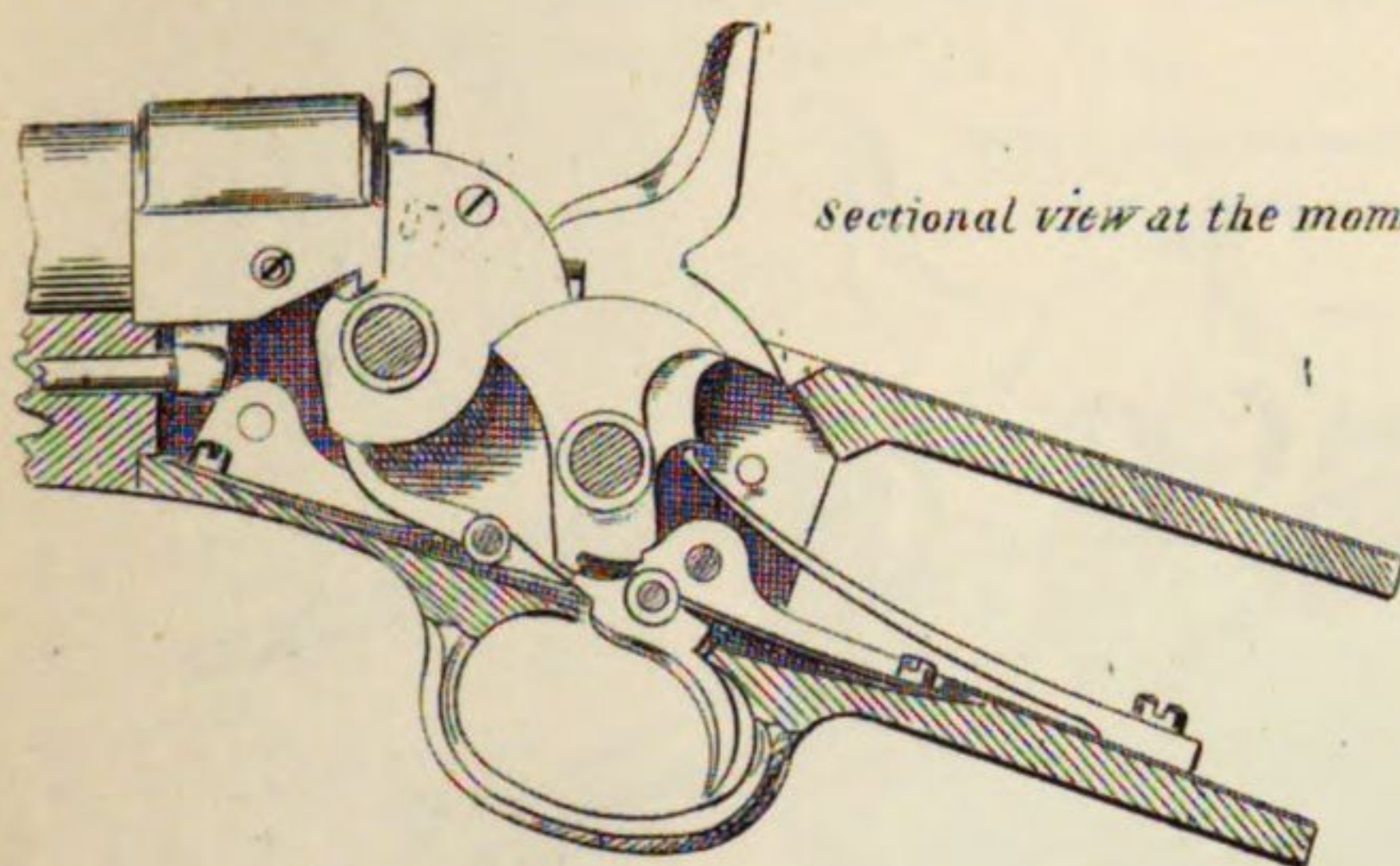
Should be kept in mind and essential to the rifle.

1. Hammer Pin	21. Trigger Pin	41. Main Spring Stop Pin	61. Trigger
2. Hammer	22. Trigger Pin	42. Main Spring	62. Trigger Pin
3. Hammer Pin	23. Trigger Pin	43. Main Spring	63. Trigger Pin
4. Hammer Pin	24. Trigger Pin	44. Main Spring	64. Trigger Pin
5. Hammer Pin	25. Trigger Pin	45. Main Spring	65. Trigger Pin
6. Hammer Pin	26. Trigger Pin	46. Main Spring	66. Trigger Pin
7. Hammer Pin	27. Trigger Pin	47. Main Spring	67. Trigger Pin
8. Hammer Pin	28. Trigger Pin	48. Main Spring	68. Trigger Pin
9. Hammer Pin	29. Trigger Pin	49. Main Spring	69. Trigger Pin
10. Hammer Pin	30. Trigger Pin	50. Main Spring	70. Trigger Pin
11. Hammer Pin	31. Trigger Pin	51. Main Spring	71. Trigger Pin
12. Hammer Pin	32. Trigger Pin	52. Main Spring	72. Trigger Pin
13. Hammer Pin	33. Trigger Pin	53. Main Spring	73. Trigger Pin
14. Hammer Pin	34. Trigger Pin	54. Main Spring	74. Trigger Pin
15. Hammer Pin	35. Trigger Pin	55. Main Spring	75. Trigger Pin
16. Hammer Pin	36. Trigger Pin	56. Main Spring	76. Trigger Pin
17. Hammer Pin	37. Trigger Pin	57. Main Spring	77. Trigger Pin
18. Hammer Pin	38. Trigger Pin	58. Main Spring	78. Trigger Pin
19. Hammer Pin	39. Trigger Pin	59. Main Spring	79. Trigger Pin
20. Hammer Pin	40. Trigger Pin	60. Main Spring	80. Trigger Pin

30 PARTS NOT PECULIAR TO THE RIFLE, OR COMMON TO ALL.

1. Lower Band	21. Lower Band	41. Lower Band	61. Lower Band
2. Lower Band	22. Lower Band	42. Lower Band	62. Lower Band
3. Lower Band	23. Lower Band	43. Lower Band	63. Lower Band
4. Lower Band	24. Lower Band	44. Lower Band	64. Lower Band
5. Lower Band	25. Lower Band	45. Lower Band	65. Lower Band
6. Lower Band	26. Lower Band	46. Lower Band	66. Lower Band
7. Lower Band	27. Lower Band	47. Lower Band	67. Lower Band
8. Lower Band	28. Lower Band	48. Lower Band	68. Lower Band
9. Lower Band	29. Lower Band	49. Lower Band	69. Lower Band
10. Lower Band	30. Lower Band	50. Lower Band	70. Lower Band
11. Lower Band	31. Lower Band	51. Lower Band	71. Lower Band
12. Lower Band	32. Lower Band	52. Lower Band	72. Lower Band
13. Lower Band	33. Lower Band	53. Lower Band	73. Lower Band
14. Lower Band	34. Lower Band	54. Lower Band	74. Lower Band
15. Lower Band	35. Lower Band	55. Lower Band	75. Lower Band
16. Lower Band	36. Lower Band	56. Lower Band	76. Lower Band
17. Lower Band	37. Lower Band	57. Lower Band	77. Lower Band
18. Lower Band	38. Lower Band	58. Lower Band	78. Lower Band
19. Lower Band	39. Lower Band	59. Lower Band	79. Lower Band
20. Lower Band	40. Lower Band	60. Lower Band	80. Lower Band

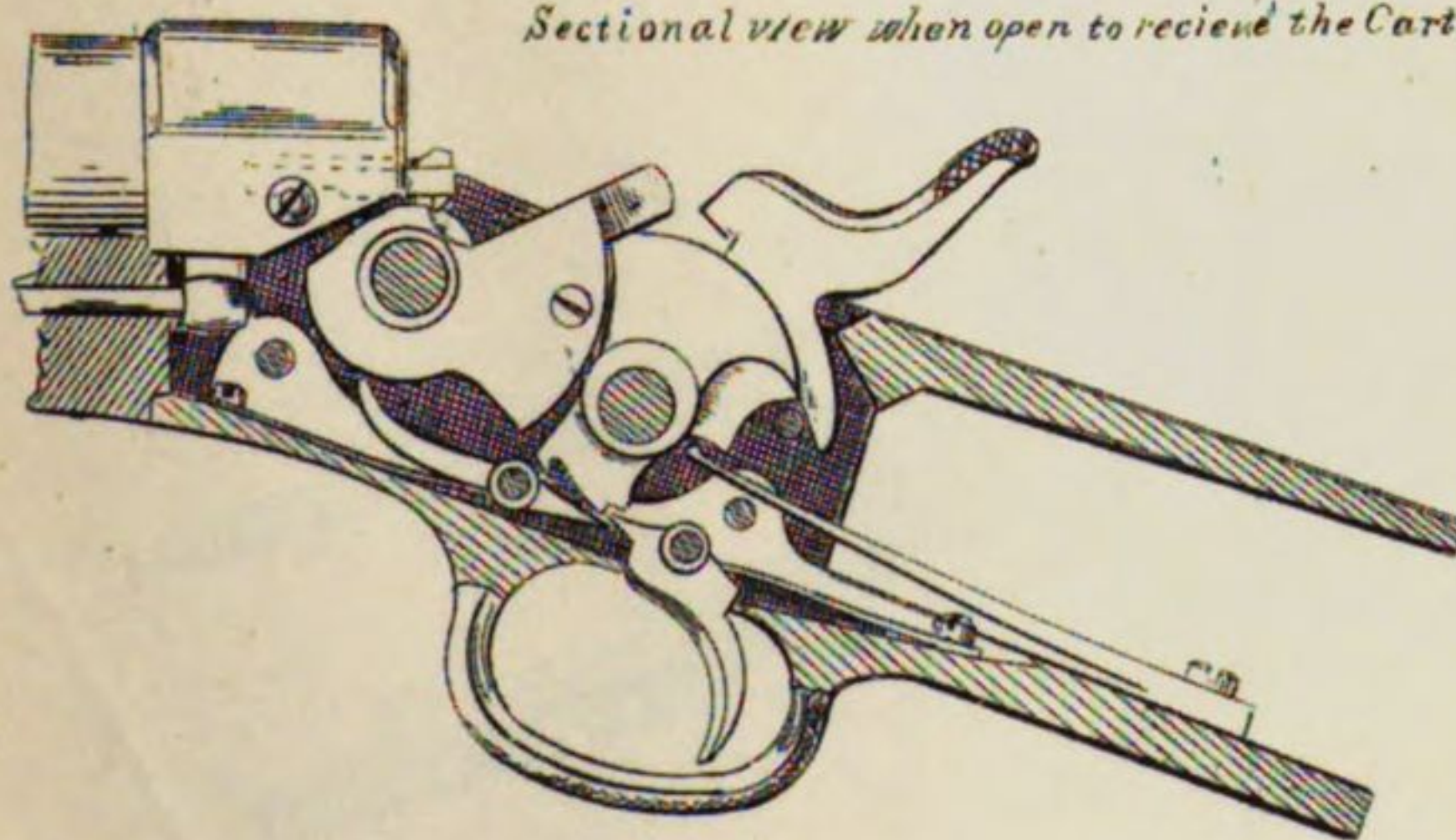
SPANISH REMINGTON, No. 41.



Sectional view at the moment of discharge

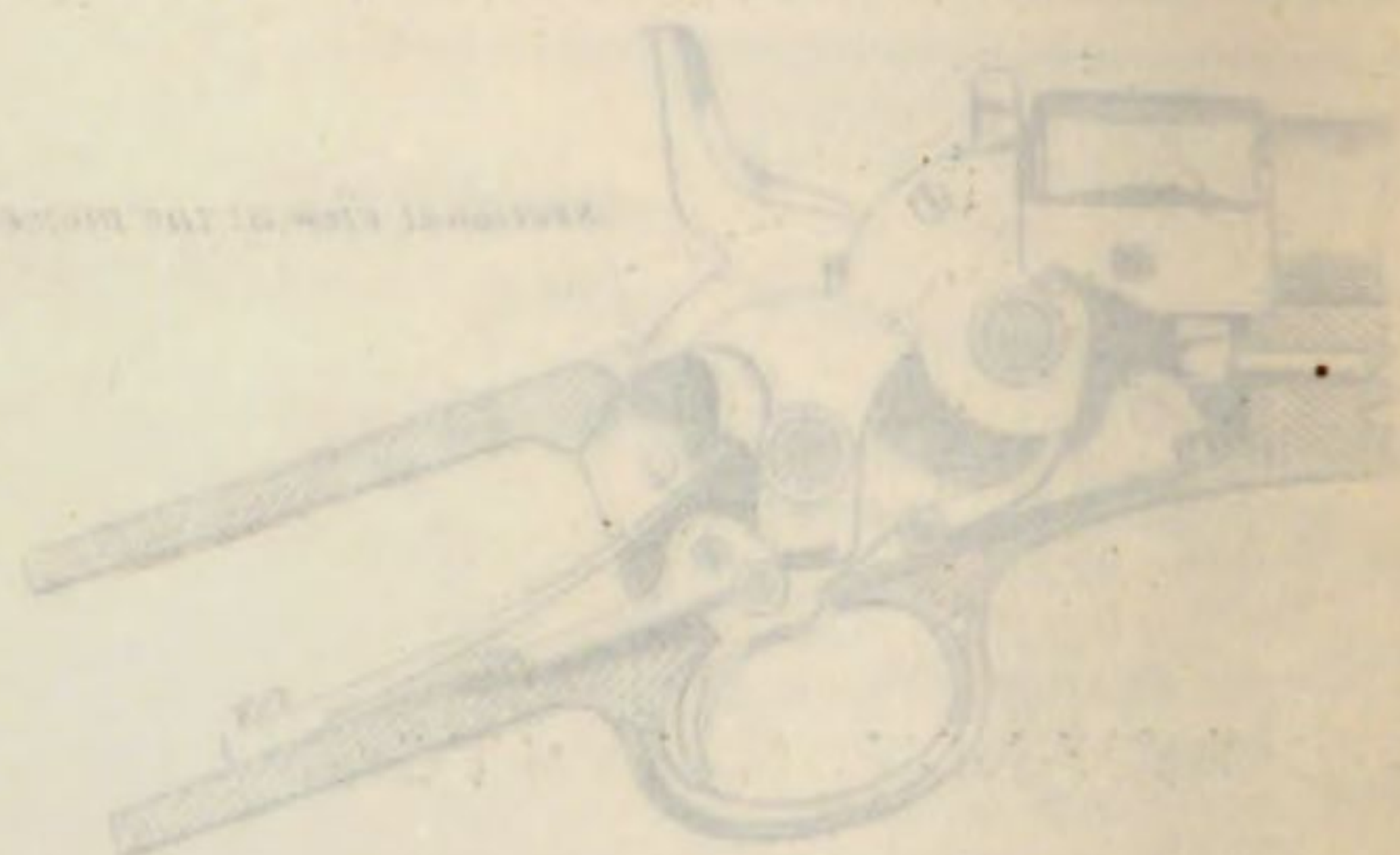
N^o41. THE REMINGTON SYSTEM

SPANISH MODEL.



Sectional view when open to receive the Cartridge

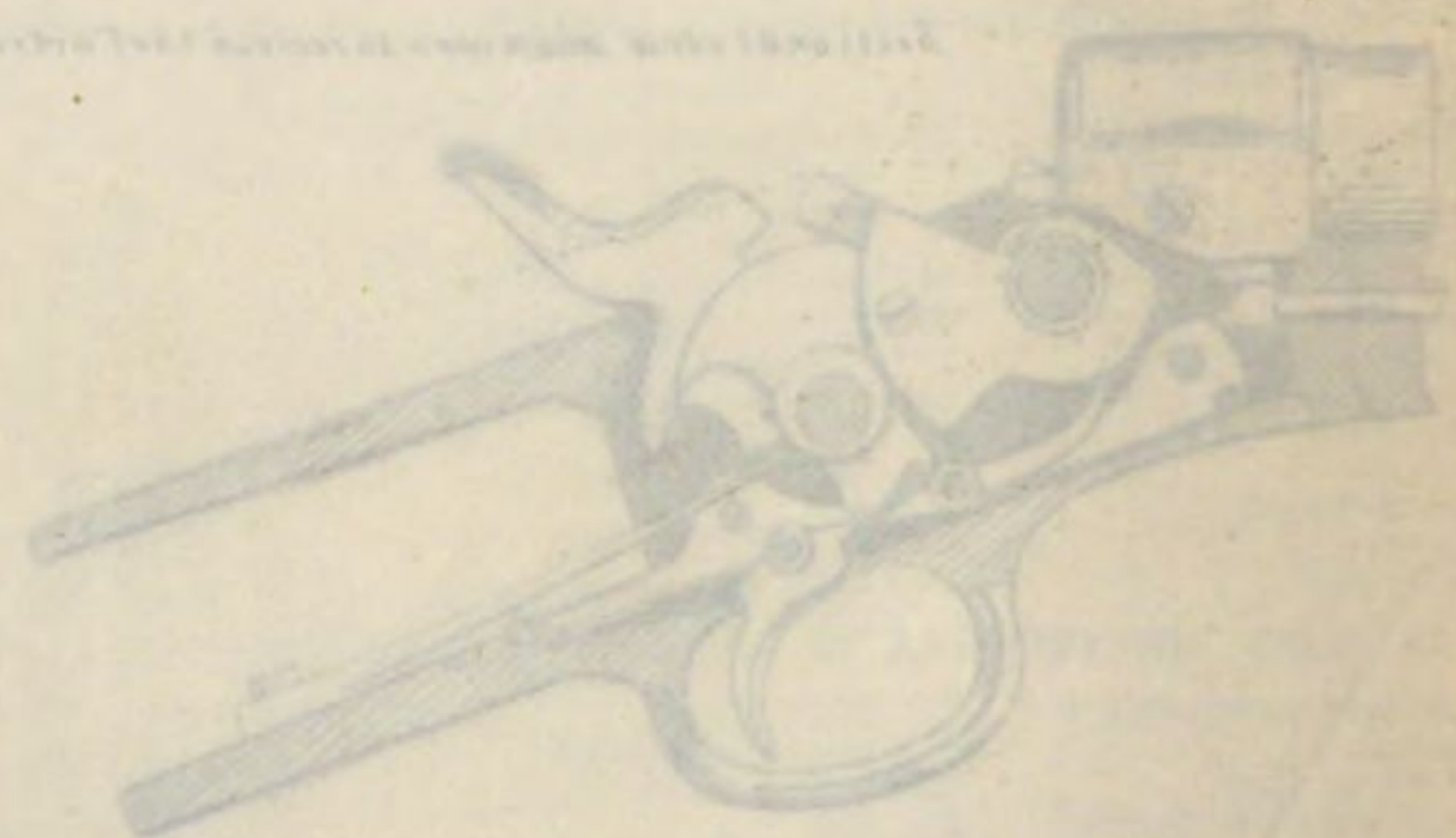
REVISED VIEW OF THE PROJECT OF AUGUST 1874



NO. 1 THE REMINGTON SYSTEM

ST. JAMES MODEL

REVISED VIEW OF THE PROJECT OF AUGUST 1874



REVISED VIEW OF THE PROJECT OF AUGUST 1874

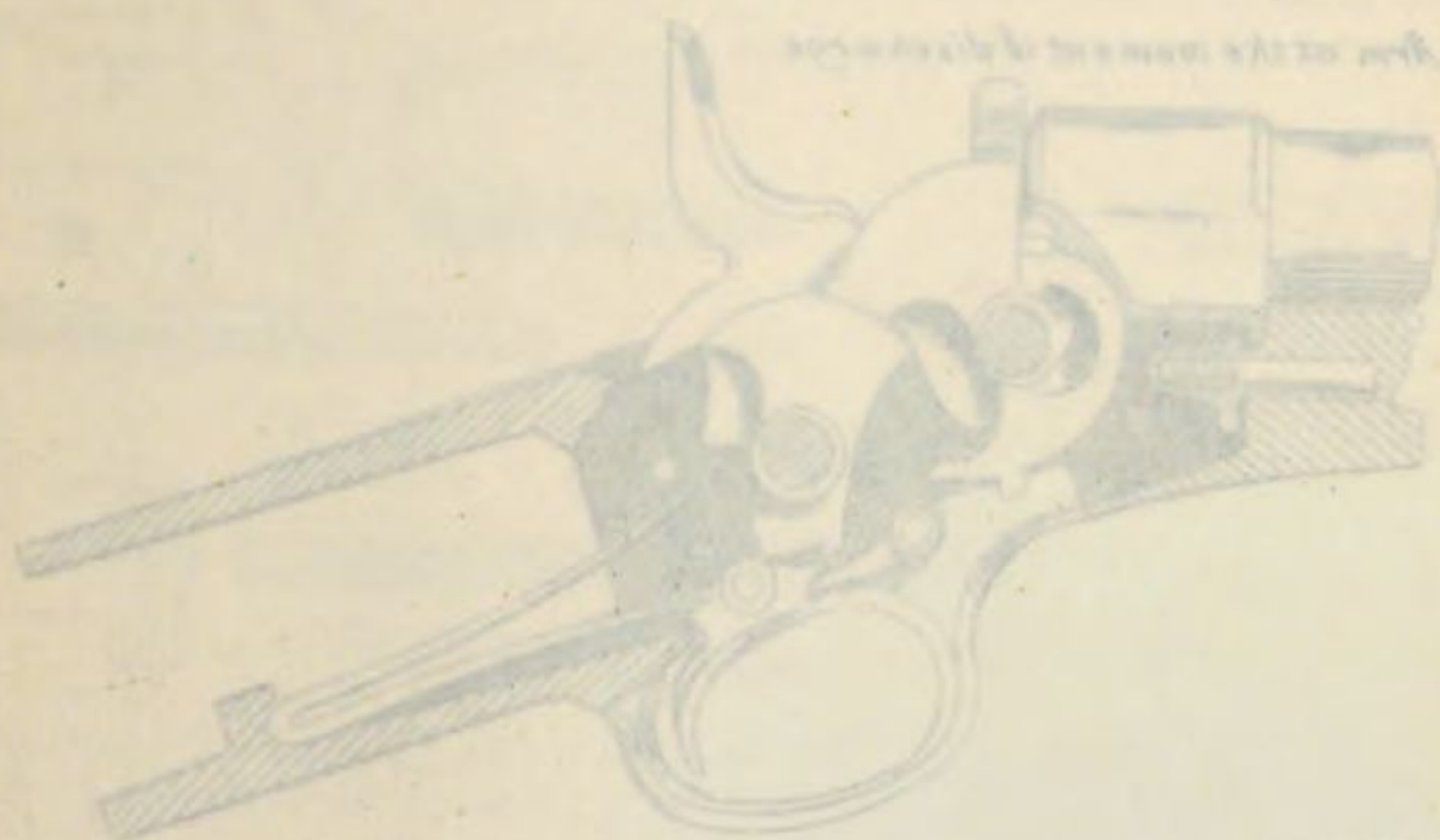


Fig. 1. Remington-Union Model No. 18.

No. 18

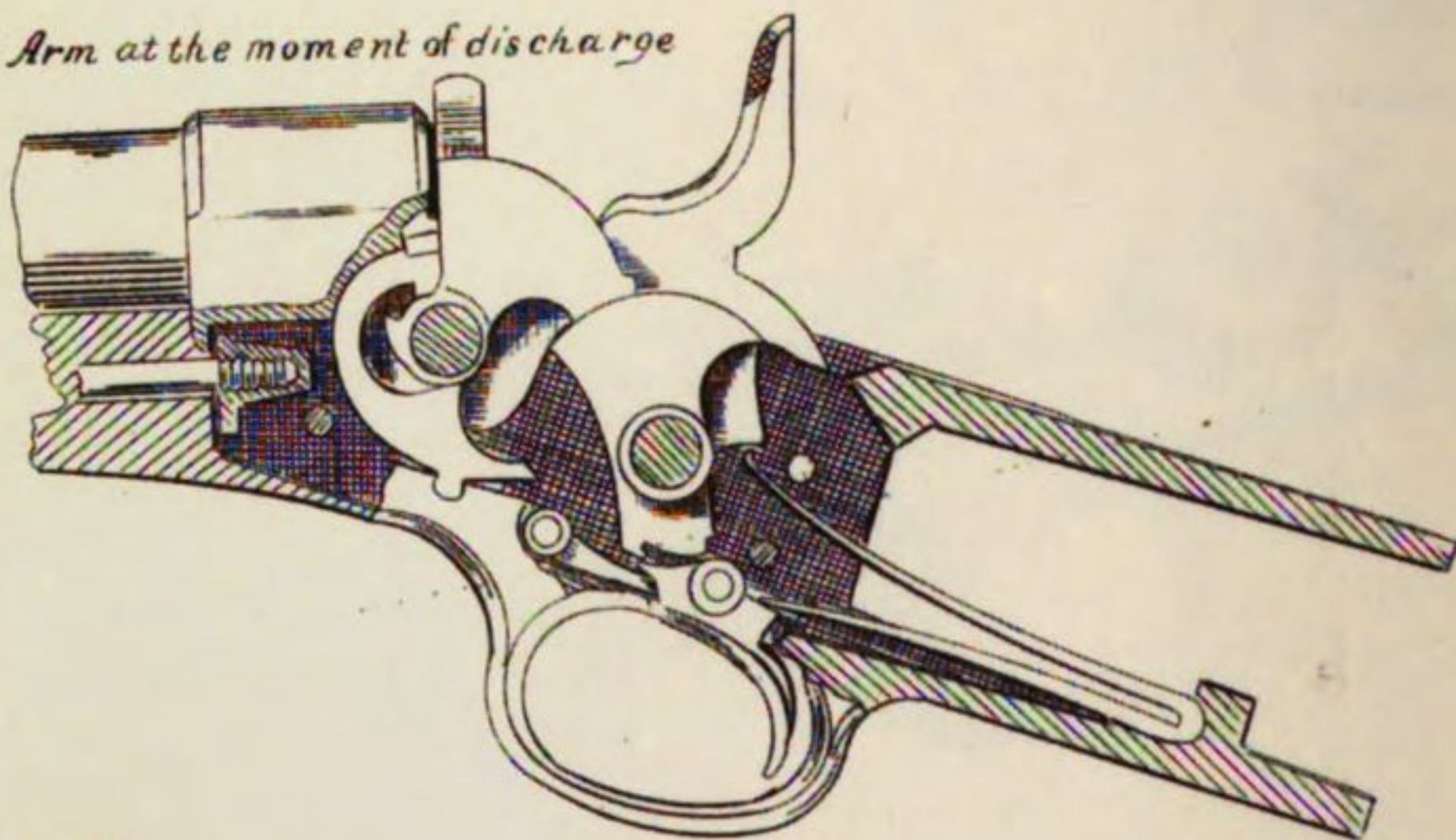
THE REMINGTON SYSTEM

REGULAR SYSTEM WITH LEVER EXTRACTOR AND DOUBLE MAIN-SPRING



Fig. 2. Remington-Union Model No. 18.

Fig.1. Arm at the moment of discharge



N^o19

THE REMINGTON SYSTEM

REGULAR SYSTEM WITH LEVER EXTRACTOR AND DOUBLE MAIN-SPRING

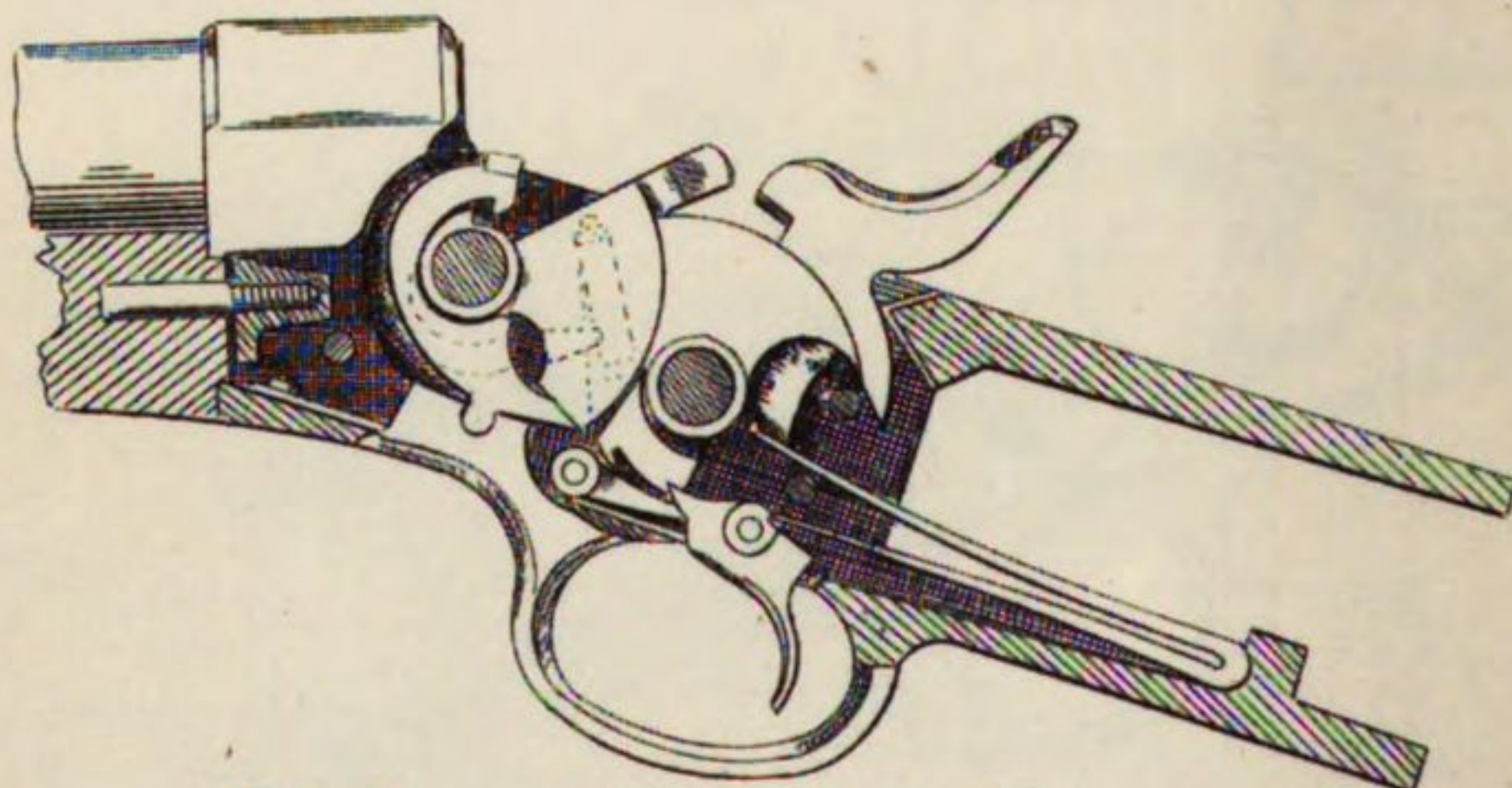
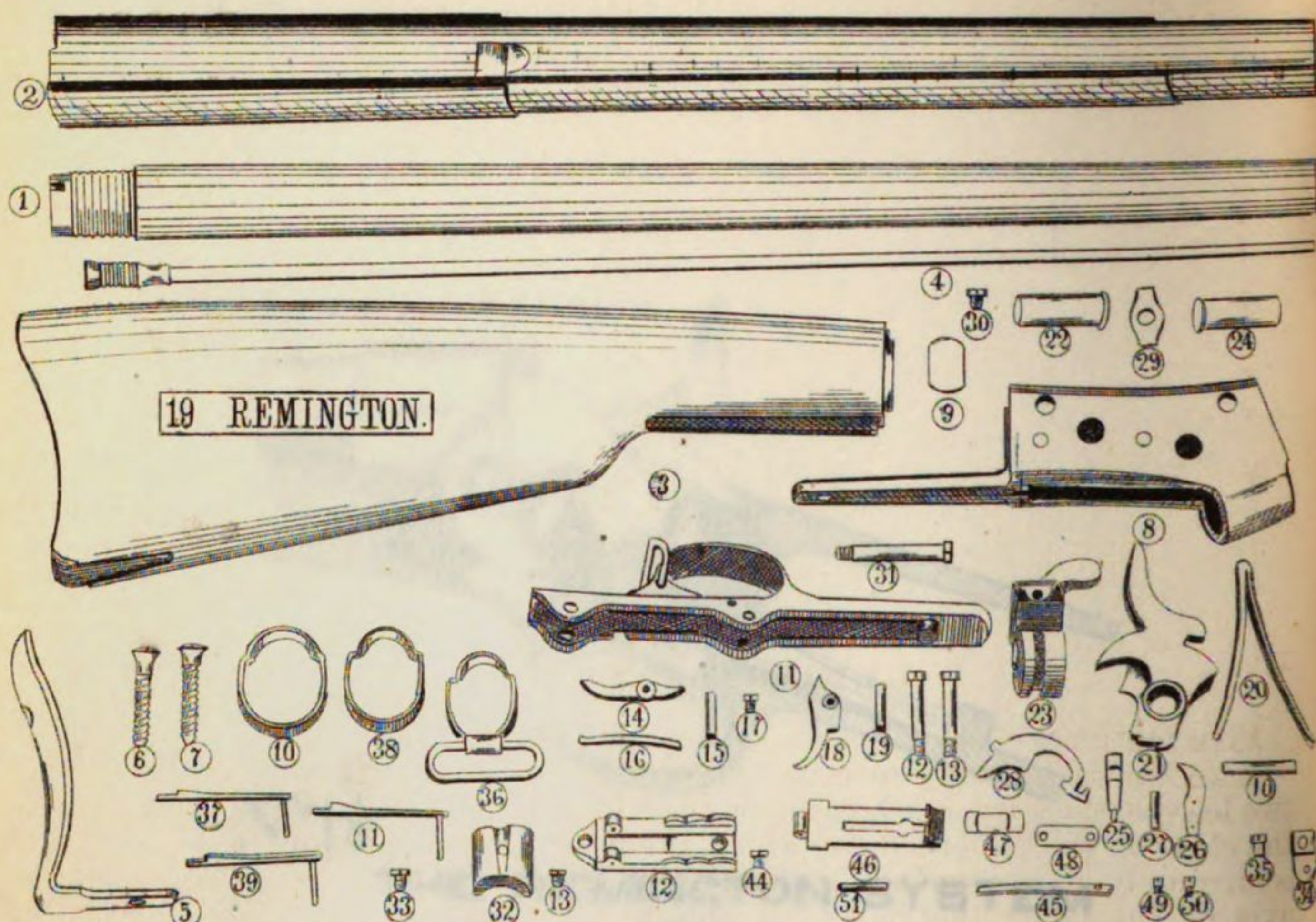


Fig.2. Arm open to receive the Cartridge



28 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:		14 Friction Lever,	24 Breech Block Pin,
2 Tip Stock,		18 Trigger.	27 Firing Pin Retractor Pin,
3 Butt Stock.		SIX Screws:	15 Friction Lever Pin,
NINE principal metallic parts not otherwise mentioned:		30 Button Screw,	19 Trigger Pin.
8 Frame,		12 Guard Screw,	Two Springs:
21 Hammer,		13 Guard Screw,	16 Friction Lever Spring,
23 Breech Block,		17 Friction Lever Spr'g Scr.,	20 Main Spring.
25 Firing Pin,		31 Tang Screw,	THREE other minor parts:
26 Firing Pin Retractor,		35 Recoil Stud Screw.	29 Button,
28 Extractor,		SIX Pins:	34 Recoil Stud,
11 Guard,		10 Main Spring Stop Pin,	34 Recoil Stud Dowel Pin.
		22 Hammer Pin,	

29 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

1 Barrel and Front Sight,	38 Middle Band,	47 Rear Sight Leaf Slide,
4 Ramrod,	39 Middle Band Spring,	48 Rear Sight Leaf Slide Cap,
5 Butt Plate,	40 Lower Band,	49 Rear Sight Leaf Slide Cap
6 Butt Plate Screw,	41 Lower Band Spring,	Screw,
7 Butt Plate Screw,	42 Rear Sight Base,	50 Rear Sight Leaf Slide Cap
32 Tip,	43 Rear Sight Base Screw,	Screw,
33 Tip Screw,	44 Rear Sight Base Screw,	51 Rear Sight Joint Pin,
36 Upper Band, Swivel & Pin,	45 Rear Sight Spring,	11 Guard Swivel and Pin,
37 Upper Band Spring,	46 Rear Sight Leaf,	9 Ramrod Stop.

REMINGTON, No. 19.

REMINGTON, No. 19.

Five motions: Cocked ; opened ; loaded ; closed ; fired.

Like No. 41 in every respect, except as to the mainspring, which has two leaves, the lower one bearing on the trigger ; and as to the extractor, the claw on the under side of which, in the first movement of opening, is struck by a corresponding shoulder of the breech-block, so near the axis of the latter that power is obtained to start the shell from its seat. By continuing the motion of the block it strikes the short arm of the extractor near its center of motion on the guard, and, by the acceleration thus impressed on its upper end, throws the shell clear of the gun.

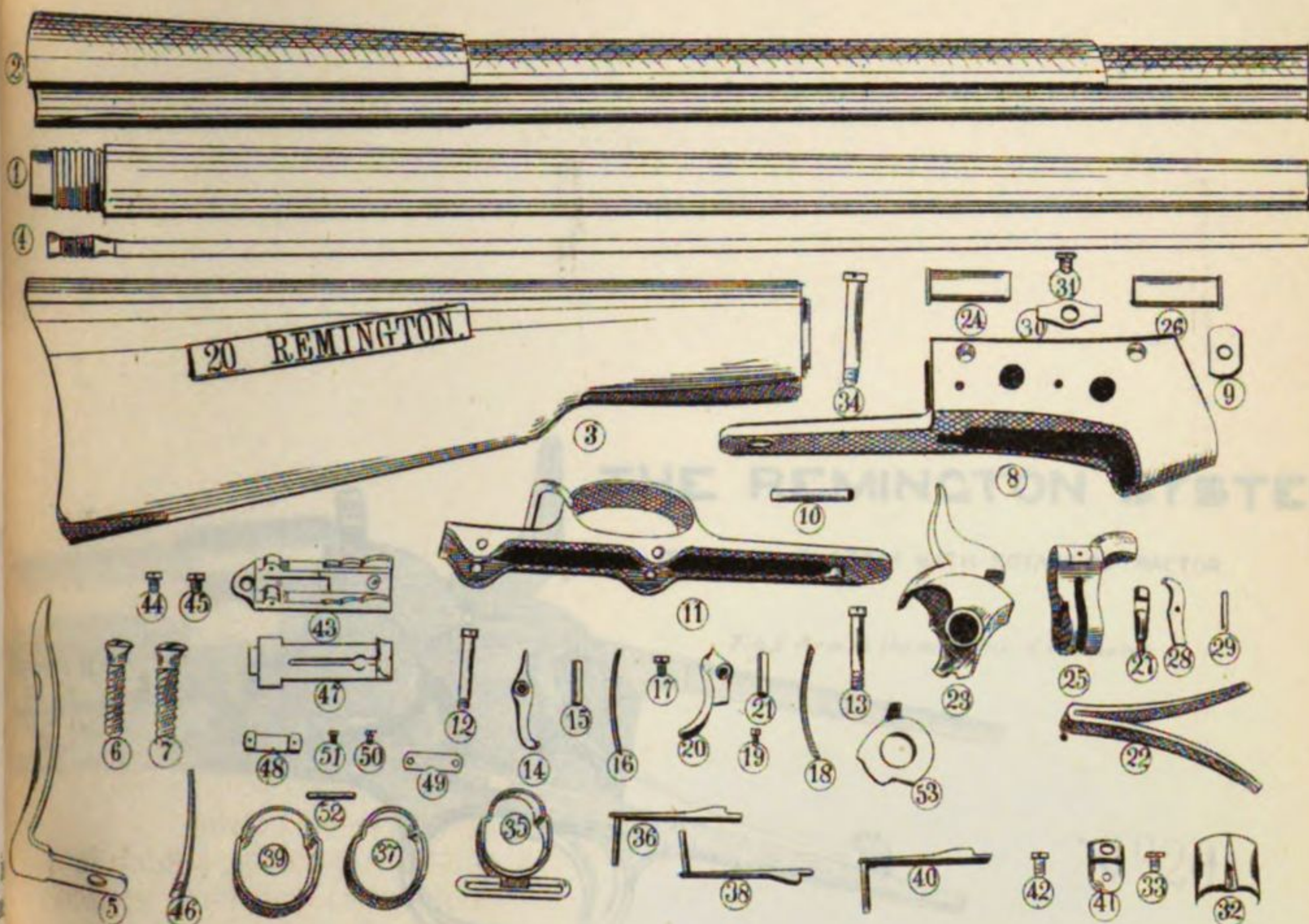
REMINGTON, No. 20.

Five motions, viz: Cocked; opened; loaded; closed; fired.

The same as No. 19, with the exception of the extractor, which is a disk rotating on a hub formed in the side of the breech-block concentrically with the pin-hole.

Extraction.—By the striking of a tooth on the edge of the extractor by the bottom of the block in opening.

Ejection.—By accelerating the revolution of the extractor by the action of a flat spring on the cam-shaped surface of a second tooth-like projection on the rim of the extractor.



30 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

NINE principal metallic parts not otherwise mentioned:

- 25 Breech Block,
- 27 Firing Pin,
- 28 Firing Pin Retractor,
- 8 Frame,
- 23 Hammer,
- 11 Guard,
- 14 Friction Lever,
- 20 Trigger,

- 53 Extractor.

SEVEN Screws:

- 31 Button Screw,
- 12 Guard Screw,
- 13 Guard Screw,
- 17 Friction Lever Spring Scr.
- 19 Ejector Spring Screw,
- 34 Tang Screw,
- 42 Recoil Stud Screw.

SIX Pins:

- 26 Breech Block Pin,
- 29 Firing Pin Retractor Pin,
- 24 Hammer Pin,

- 10 Main Spring Stop Pin,
- 15 Friction Lever Pin,
- 21 Trigger Pin.

THREE Springs:

- 22 Main Spring,
- 16 Friction Lever Spring,
- 18 Ejector Spring.

THREE other minor parts:

- 30 Button,
- 41 Recoil Stud,
- 41 Recoil Stud Dowel Pin.

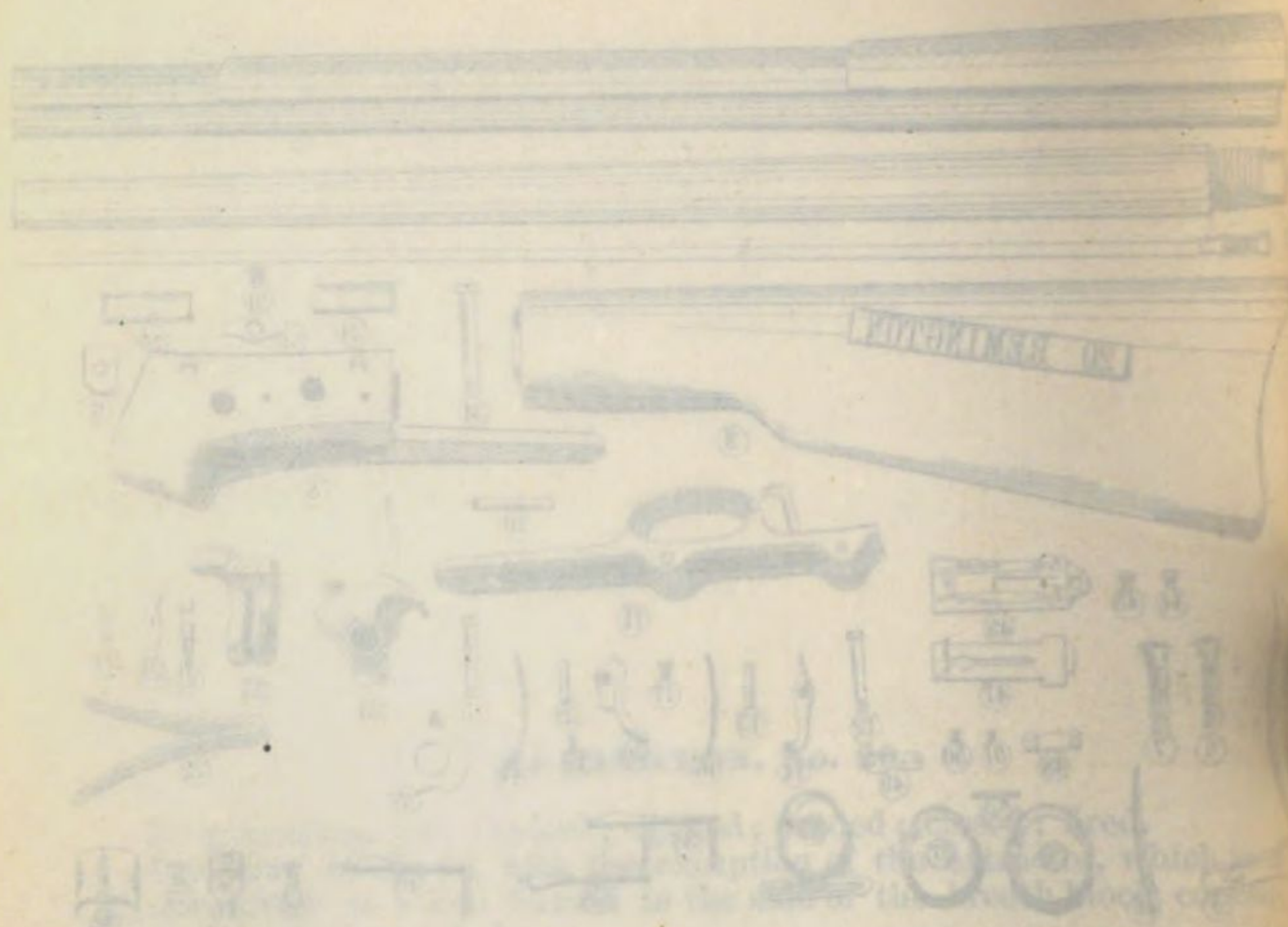
29 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 32 Tip,
- 33 Tip Screw,
- 35 Upper Band, Swivel & Pin,
- 36 Upper Band Spring,

- 37 Middle Band,
- 38 Middle Band Spring,
- 39 Lower Band,
- 40 Lower Band Spring,
- 43 Rear Sight Base,
- 44 Rear Sight Base Screw,
- 45 Rear Sight Base Screw,
- 46 Rear Sight Spring,
- 47 Rear Sight Leaf,

- 48 Rear Sight Leaf Slide,
- 49 Rear Sight Leaf Slide Cap,
- 50 Rear Sight Leaf Slide Cap Screw,
- 51 Rear Sight Leaf Slide Cap Screw,
- 52 Rear Sight Joint Pin,
- 9 Ramrod Stop,
- 11 Guard Swivel and Pin.

REMINGTON, No. 20.



RECEIVED BY THE ARMY
 THE FOLLOWING PARTS
 ARE REQUIRED FOR THE
 REMINGTON RIFLE
 NO. 20

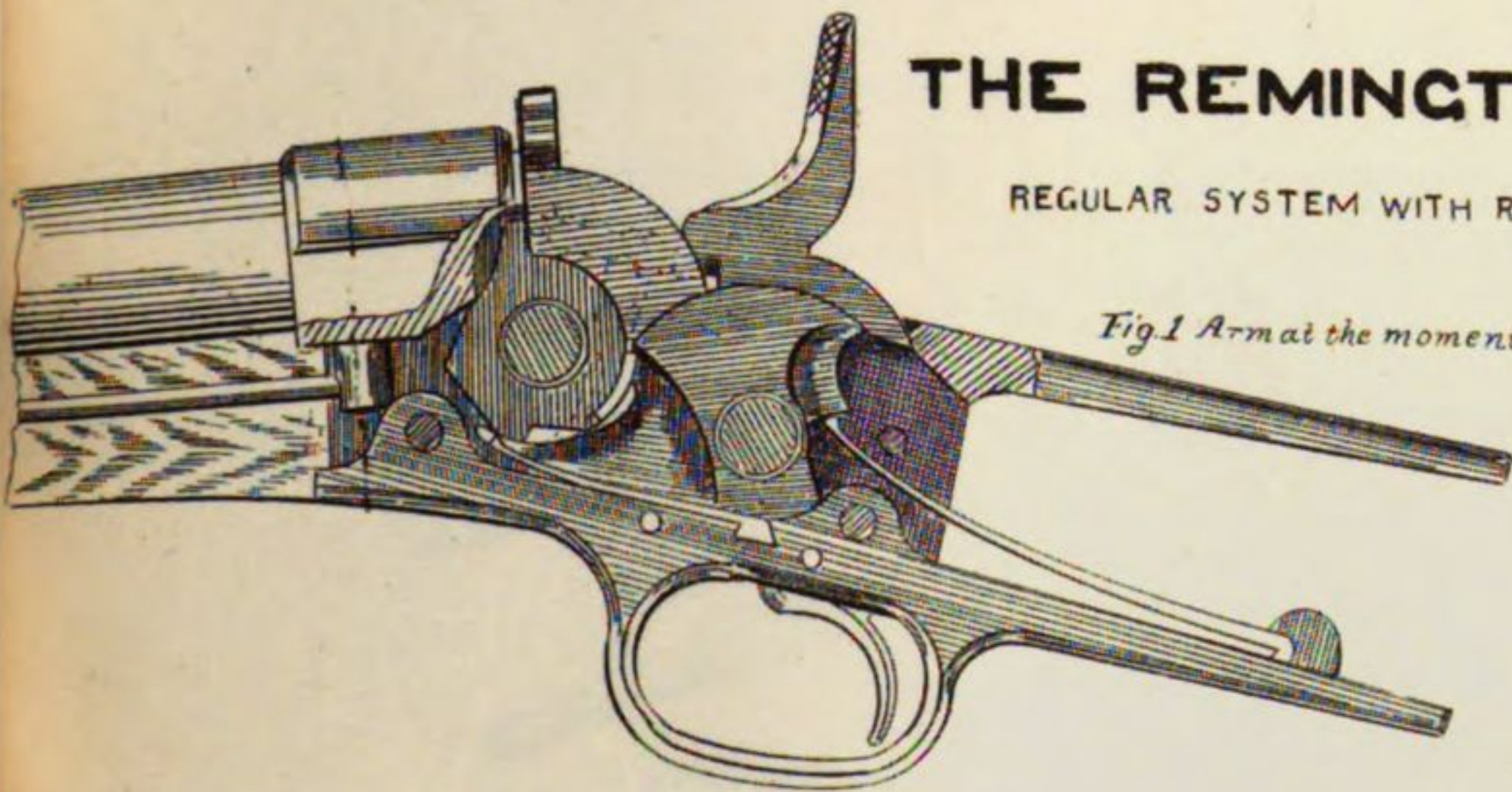
PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM		PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL	
1	Trigger	1	Upper band spring
2	Trigger lever	2	Upper band (with 2 pins)
3	Hammer	3	Tip screw
4	Hammer pin	4	Tip screw
5	Hammer pin	5	Tip screw
6	Hammer pin	6	Tip screw
7	Hammer pin	7	Tip screw
8	Hammer pin	8	Tip screw
9	Hammer pin	9	Tip screw
10	Hammer pin	10	Tip screw
11	Hammer pin	11	Tip screw
12	Hammer pin	12	Tip screw
13	Hammer pin	13	Tip screw
14	Hammer pin	14	Tip screw
15	Hammer pin	15	Tip screw
16	Hammer pin	16	Tip screw
17	Hammer pin	17	Tip screw
18	Hammer pin	18	Tip screw
19	Hammer pin	19	Tip screw
20	Hammer pin	20	Tip screw
21	Hammer pin	21	Tip screw
22	Hammer pin	22	Tip screw
23	Hammer pin	23	Tip screw
24	Hammer pin	24	Tip screw
25	Hammer pin	25	Tip screw
26	Hammer pin	26	Tip screw
27	Hammer pin	27	Tip screw
28	Hammer pin	28	Tip screw
29	Hammer pin	29	Tip screw
30	Hammer pin	30	Tip screw
31	Hammer pin	31	Tip screw
32	Hammer pin	32	Tip screw
33	Hammer pin	33	Tip screw
34	Hammer pin	34	Tip screw
35	Hammer pin	35	Tip screw
36	Hammer pin	36	Tip screw
37	Hammer pin	37	Tip screw
38	Hammer pin	38	Tip screw
39	Hammer pin	39	Tip screw
40	Hammer pin	40	Tip screw
41	Hammer pin	41	Tip screw
42	Hammer pin	42	Tip screw
43	Hammer pin	43	Tip screw
44	Hammer pin	44	Tip screw
45	Hammer pin	45	Tip screw
46	Hammer pin	46	Tip screw
47	Hammer pin	47	Tip screw

RECEIVED BY THE ARMY

THE REMINGTON SYSTEM

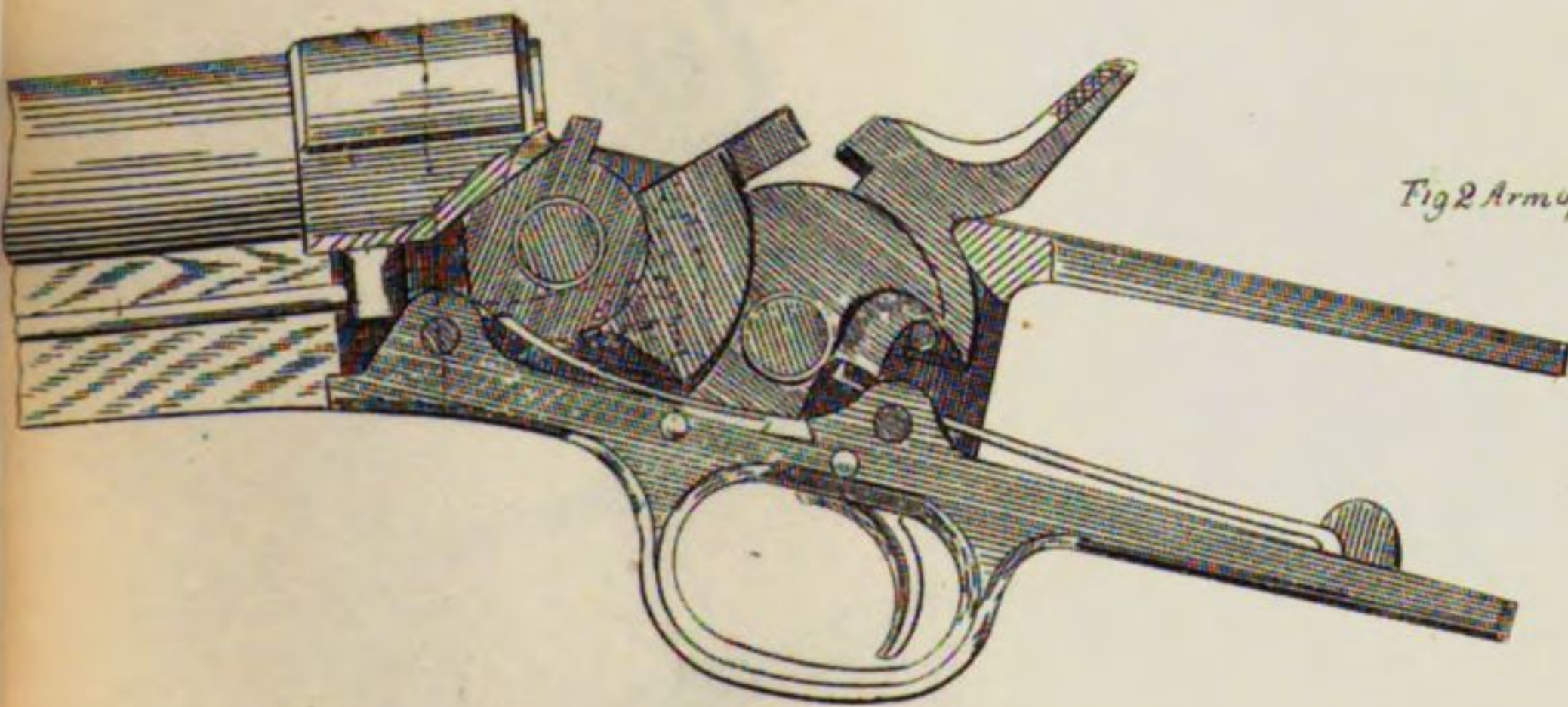
REGULAR SYSTEM WITH ROTARY EXTRACTOR

Fig 1 Arm at the moment of discharge



N°20

Fig 2 Arm open to receive the Cartridge



THE REMINGTON SYSTEM

REMARKS BY THE REMINGTON SYSTEM

THE REMINGTON SYSTEM

No. 50



No. 3

THE REMINGTON SYSTEM

REAR VIEW WITH POWER EXTRACTOR



N^o43

THE REMINGTON SYSTEM

REGULAR SYSTEM WITH POWER EXTRACTOR

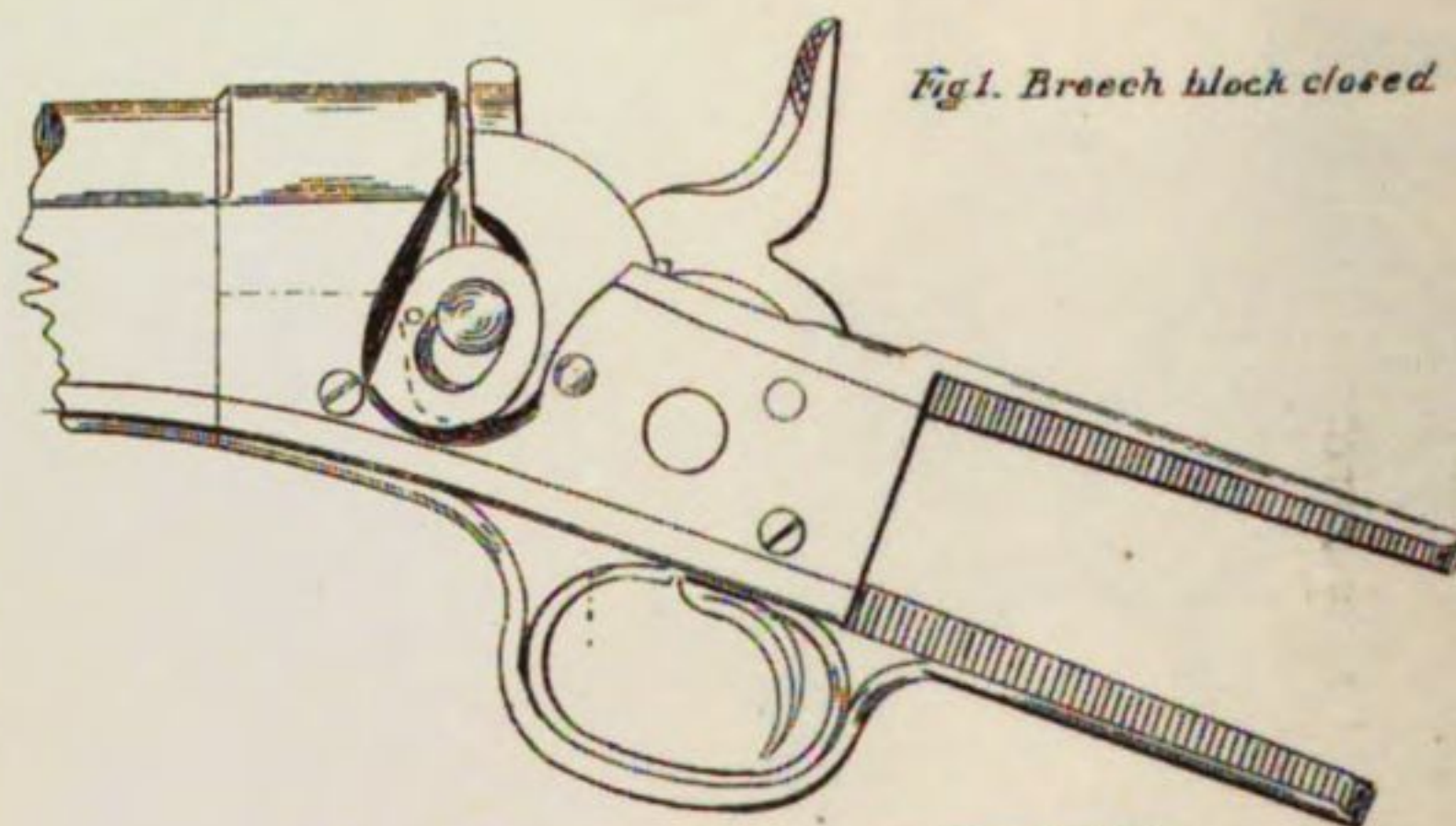


Fig. 1. Breech block closed

Fig. 2. Extractor at extreme of its power movement

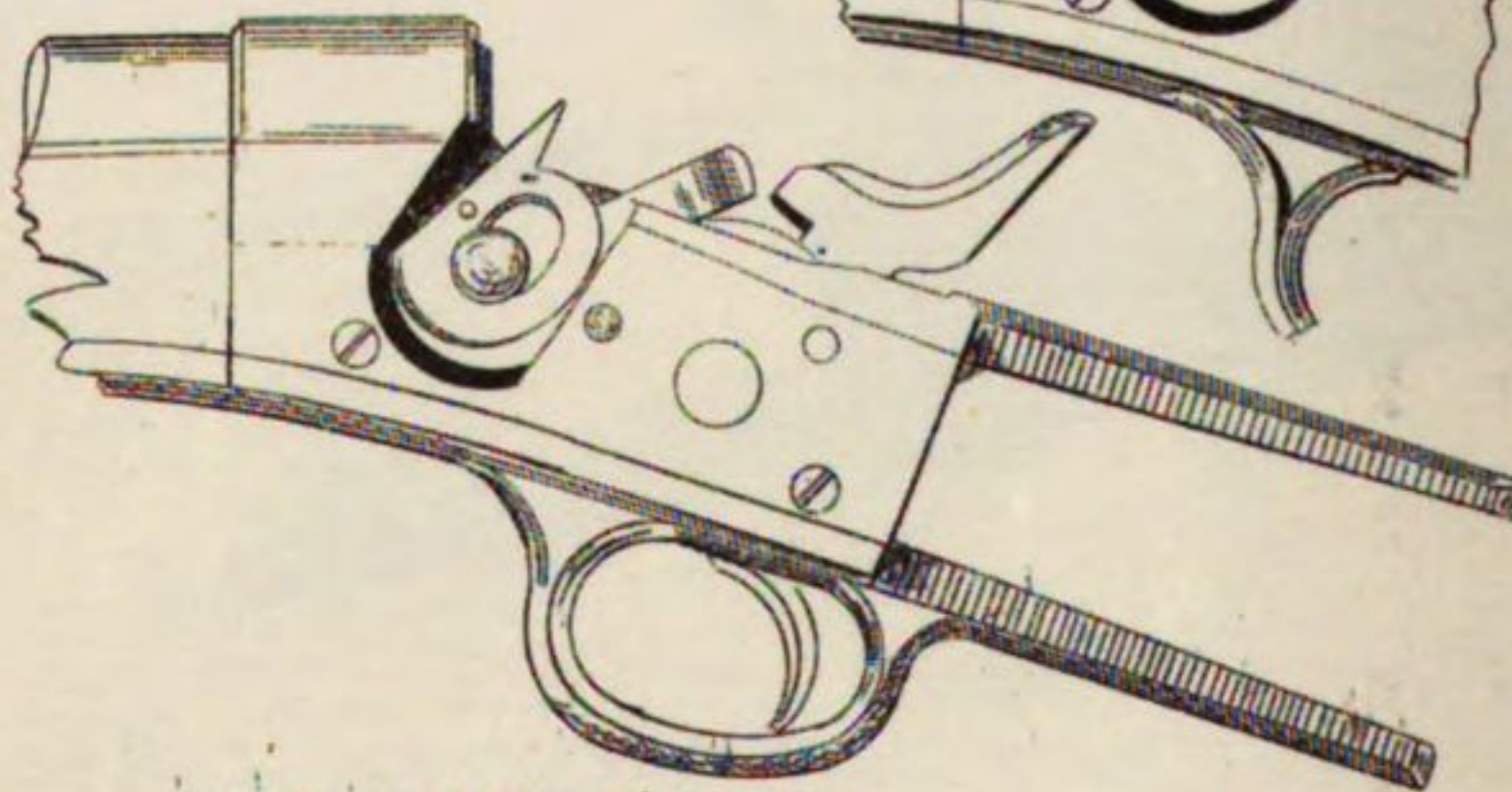
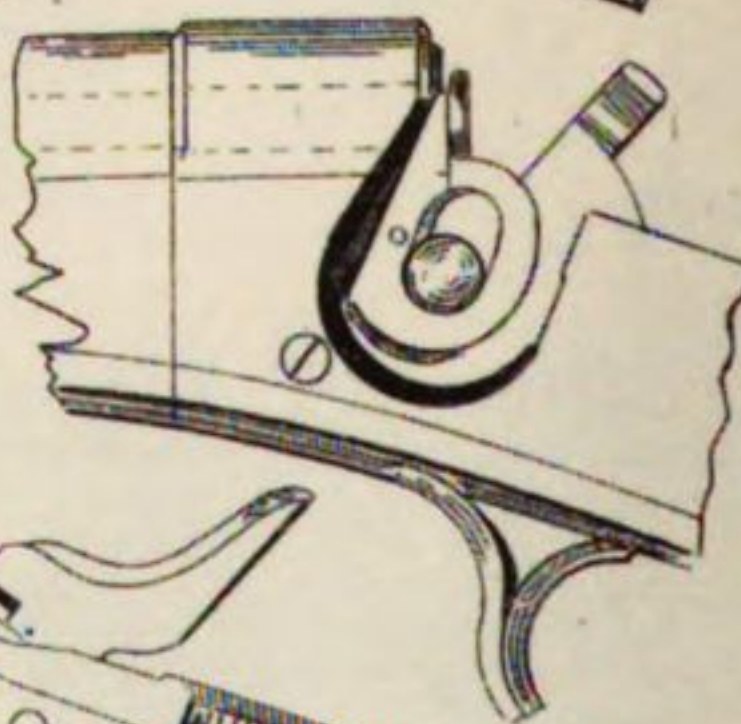
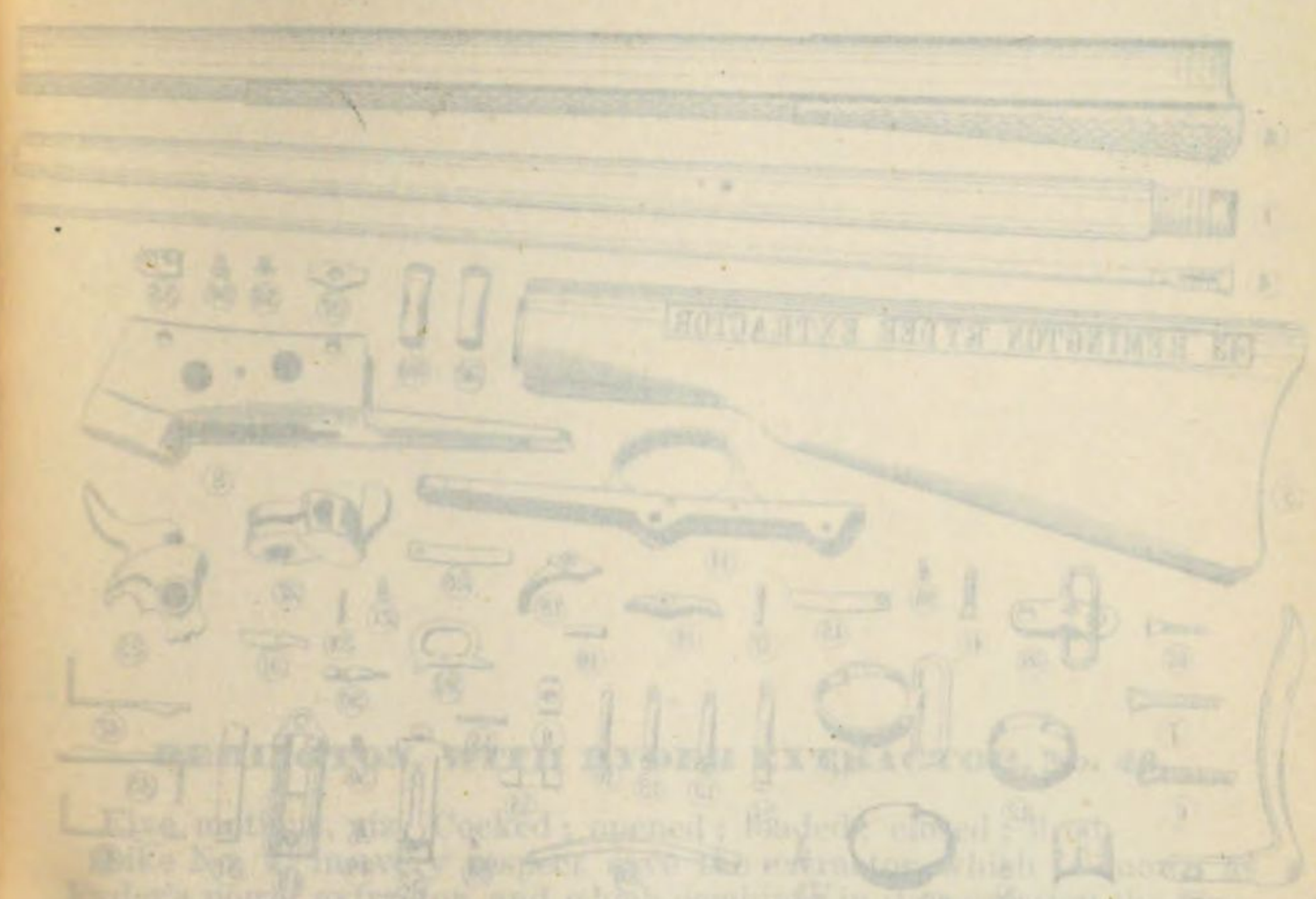


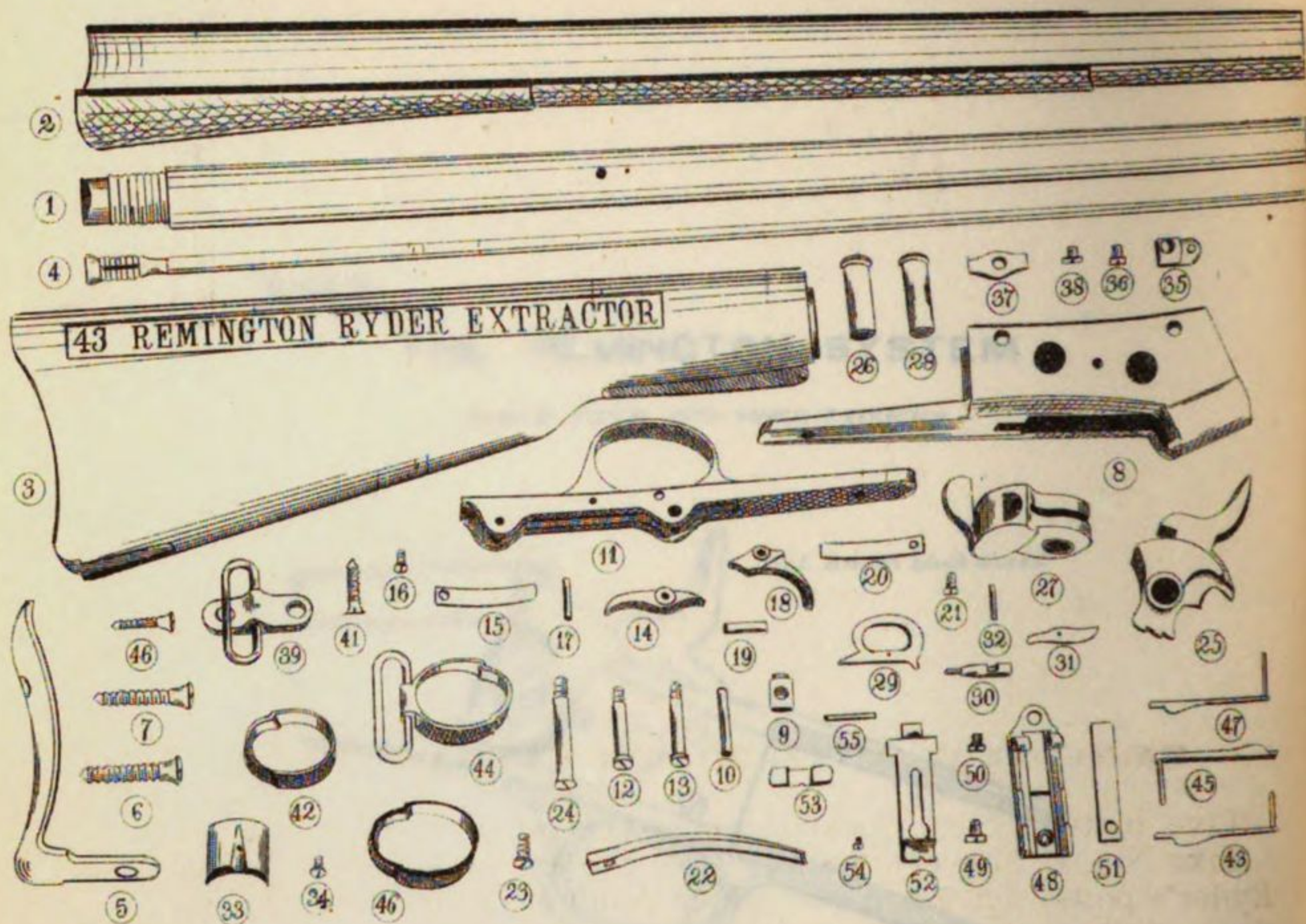
Fig. 3. Breech block full open



and all other parts in the machine which are not shown in the drawing are to be made to the same size and shape as the parts shown in the drawing. The parts shown in the drawing are to be made to the same size and shape as the parts shown in the drawing. The parts shown in the drawing are to be made to the same size and shape as the parts shown in the drawing.

PARTS NOT PRELIMINARY TO THE SYSTEM, OR COMMON TO ALL		PARTS NOT PRELIMINARY TO THE SYSTEM, OR COMMON TO ALL	
1	Lower Band Spring	1	Lower Band Spring
2	Lower Band Spring	2	Lower Band Spring
3	Lower Band Spring	3	Lower Band Spring
4	Lower Band Spring	4	Lower Band Spring
5	Lower Band Spring	5	Lower Band Spring
6	Lower Band Spring	6	Lower Band Spring
7	Lower Band Spring	7	Lower Band Spring
8	Lower Band Spring	8	Lower Band Spring
9	Lower Band Spring	9	Lower Band Spring
10	Lower Band Spring	10	Lower Band Spring
11	Lower Band Spring	11	Lower Band Spring
12	Lower Band Spring	12	Lower Band Spring
13	Lower Band Spring	13	Lower Band Spring
14	Lower Band Spring	14	Lower Band Spring
15	Lower Band Spring	15	Lower Band Spring
16	Lower Band Spring	16	Lower Band Spring
17	Lower Band Spring	17	Lower Band Spring
18	Lower Band Spring	18	Lower Band Spring
19	Lower Band Spring	19	Lower Band Spring
20	Lower Band Spring	20	Lower Band Spring
21	Lower Band Spring	21	Lower Band Spring
22	Lower Band Spring	22	Lower Band Spring
23	Lower Band Spring	23	Lower Band Spring
24	Lower Band Spring	24	Lower Band Spring
25	Lower Band Spring	25	Lower Band Spring
26	Lower Band Spring	26	Lower Band Spring
27	Lower Band Spring	27	Lower Band Spring
28	Lower Band Spring	28	Lower Band Spring
29	Lower Band Spring	29	Lower Band Spring
30	Lower Band Spring	30	Lower Band Spring

HEMMINGTON RYDER EXTRACTOR No. 12



32 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

- Two of Wood:
- 2 Tip Stock,
 - 3 Butt Stock.
- NINE principal metallic parts
not otherwise mentioned:
- 8 Frame,
 - 25 Hammer,
 - 27 Breech Block,
 - 30 Firing Pin,
 - 31 Firing Pin Retractor,
 - 29 Extractor,
 - 11 Guard,
 - 14 Locking Lever,

- 18 Trigger.
- EIGHT Screws:
- 12 Guard Screw,
 - 13 Guard Screw,
 - 16 Friction Lever Spr'g Scr.,
 - 21 Sear Spring Screw,
 - 23 Main Spring Screw,
 - 38 Button Screw,
 - 24 Tang Screw,
 - 36 Recoil Stud Screw.
- SEVEN Pins:
- 26 Hammer Pin,
 - 27 Extractor Pin,

- 28 Breech Block Pin,
 - 32 Firing Pin Retractor Pin,
 - 17 Friction Lever Pin,
 - 19 Trigger Pin,
 - 10 Main Spring Stop Pin.
- THREE Springs:
- 15 Friction Lever Spring,
 - 20 Sear Spring,
 - 22 Main Spring.
- THREE other minor parts:
- 35 Recoil Stud,
 - 35 Recoil Stud Dowel Pin,
 - 37 Button.

30 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 33 Tip,
- 34 Tip Screw,
- 42 Upper Band,
- 43 Upper Band Spring,
- 44 Middle Band, Swivel & Pin,
- 45 Middle Band Spring,
- 46 Lower Band,
- 47 Lower Band Spring,
- 48 Rear Sight Base,
- 49 Rear Sight Base Screw,
- 50 Rear Sight Base Screw,
- 51 Rear Sight Spring,
- 52 Rear Sight Leaf,
- 53 Rear Sight Leaf Slide,
- 54 Rear Sight Leaf Screw,

- 55 Rear Sight Joint Screw,
- 39 Butt Stock Swivel Plate, Swivel and Pin,
- 40 Butt Stock Swivel Plate Screw,
- 41 Butt Stock Swivel Plate Screw,
- 9 Ramrod Stop.

REMINGTON, RYDER EXTRACTOR, No. 43.

REMINGTON, WITH RYDER EXTRACTOR, No. 43.

Five motions, viz: Cocked ; opened ; loaded ; closed ; fired.

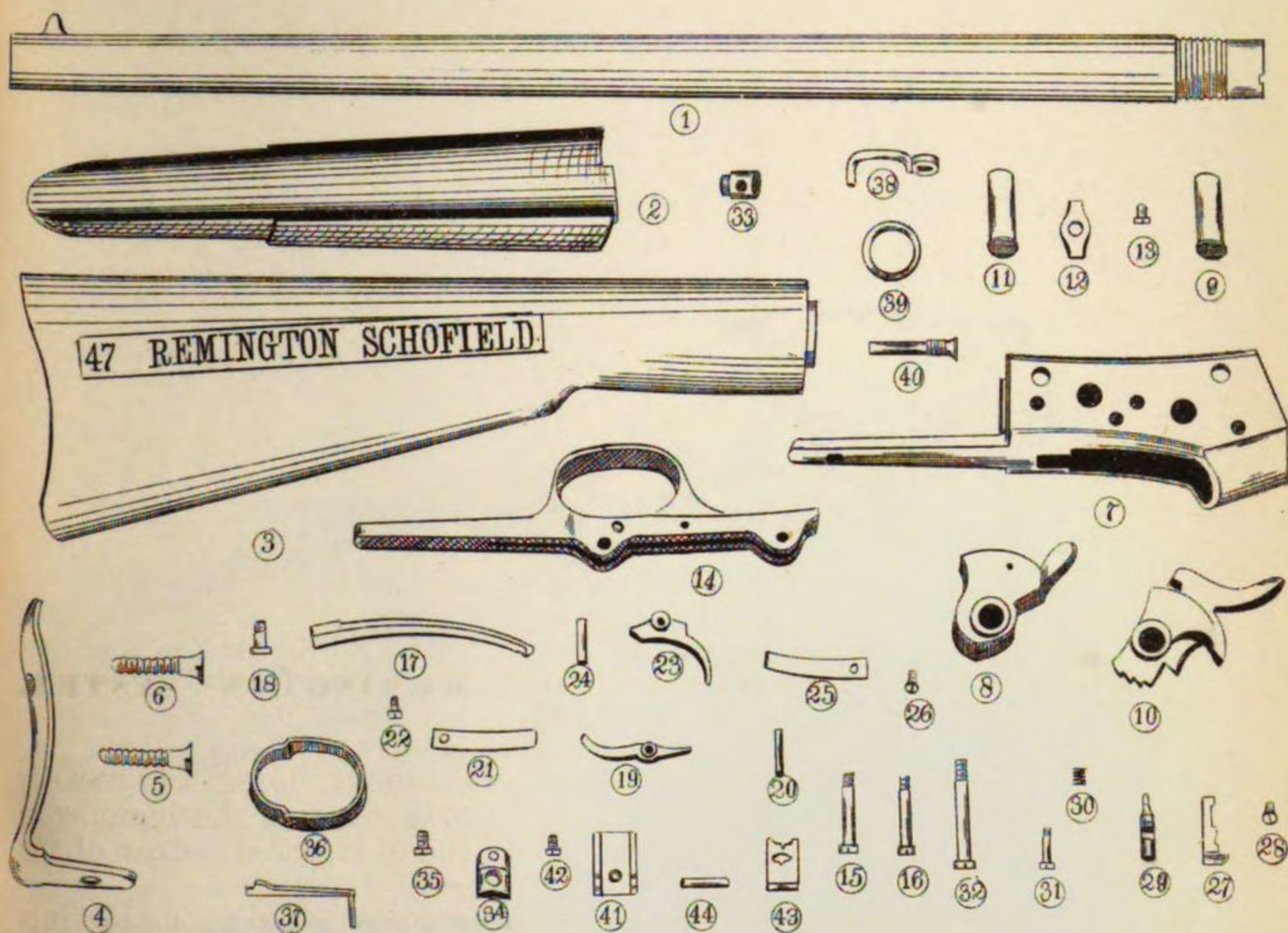
Like No. 41 in every respect save the extractor, which is known as Ryder's power extractor, and which combines in its operation the functions of the wedge and the lever, the former property being called into play in the first moments of opening, when the ascent of the front portion of the breech-block passes the wedge behind the rim of the cartridge and starts it from its seat. By continuing the motion of the block it bears against the body of the extractor and brings it bodily backward, its motion being accelerated by a quick motion of the hand in opening the piece. The arm also differs from No. 41 in having a firing-pin retractor, like that in No. 21.

**SCHOFIELD ALTERATION OF REMINGTON SYSTEM,
No. 47.**

Six motions, viz: Half-cocked; opened; loaded; closed; full-cocked; fired. Two of these may be combined by first bringing the hammer to the full-cock, at the sacrifice, however, of the distinctive feature of the arm.

Differs only from Remington No. 41, in having the face of the locking-shoulder of the hammer cut away, and in having an undercut notch on the hammer between the other two, which is so placed that when the hammer is resting on it, the breech may be opened and closed without bringing the hammer to the full-cock.

For security in carrying the piece loaded, the breech may be locked by letting down the hammer to the first notch.



32 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

EIGHT principal metallic parts not otherwise mentioned:

- 7 Frame,
- 8 Breech Block,
- 10 Hammer,
- 14 Guard,
- 29 Firing Pin,
- 19 Locking Lever,
- 23 Trigger,
- 27 Extractor.

TEN Screws:

- 31 Firing Pin Screw,
- 15 Guard Screw,
- 16 Guard Screw,
- 22 Friction Lever Spr'g Scr.,
- 26 Sear Spring Screw,
- 18 Main Spring Screw,
- 13 Button Screw,
- 28 Extractor Screw,
- 32 Tang Screw,
- 35 Recoil Stud Screw.

FIVE Pins:

- 9 Breech Block Pin,
- 11 Hammer Pin,

- 40 Main Spring Stop Pin and Frame Swivel Screw,
- 20 Friction Lever Pin,
- 24 Trigger Pin.

FOUR Springs:

- 30 Firing Pin Spring,
- 21 Friction Lever Spring,
- 25 Sear Spring,
- 17 Main Spring.

THREE other minor parts:

- 12 Button,
- 34 Recoil Stud,
- 34 Recoil Stud Dowel Pin.

14 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

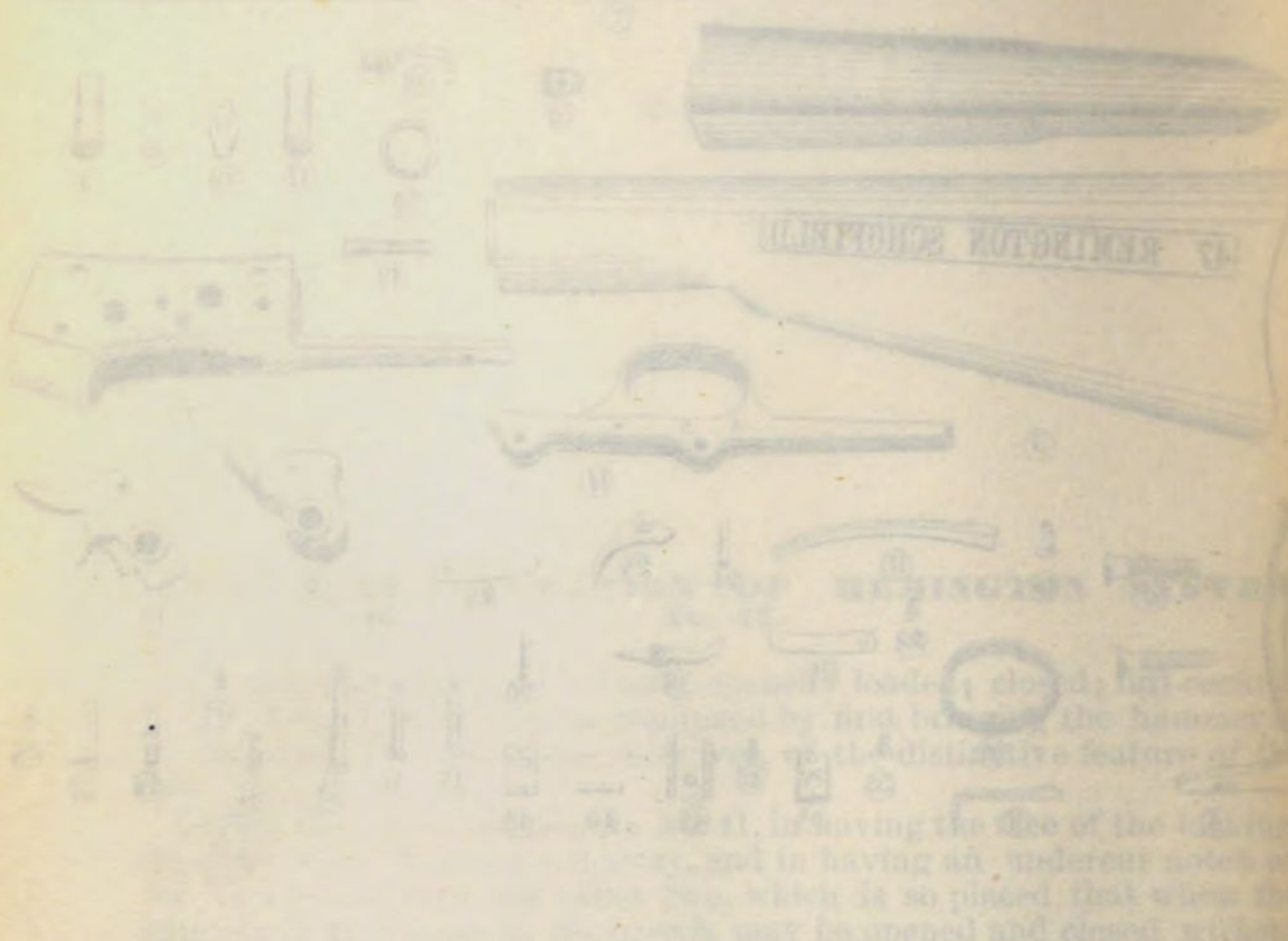
- 1 Barrel and Front Sight,
- 4 Butt Plate,
- 5 Butt Plate Screw,
- 6 Butt Plate Screw,
- 36 Band,

- 37 Band Spring,
- 38 Frame Swivel Bar,
- 39 Frame Swivel Ring,
- 41 Rear Sight Base,
- 42 Rear Sight Base Screw,

- 43 Rear Sight Leaf,
- 44 Rear Sight Joint Pin,
- 33 Ramrod Stop.

REMINGTON-SCHOFIELD, No. 47.

REMINGTON SCHOTTILL



PARTS SPECIFIC TO THE RIFLE OR CARBINE TO THE RIFLE		PARTS SPECIFIC TO THE RIFLE OR CARBINE TO THE RIFLE	
1	Barrel and Front Sight	1	Barrel and Front Sight
2	Rifle Pin	2	Rifle Pin
3	Rifle Pin	3	Rifle Pin
4	Rifle Pin	4	Rifle Pin
5	Rifle Pin	5	Rifle Pin
6	Rifle Pin	6	Rifle Pin
7	Rifle Pin	7	Rifle Pin
8	Rifle Pin	8	Rifle Pin
9	Rifle Pin	9	Rifle Pin
10	Rifle Pin	10	Rifle Pin
11	Rifle Pin	11	Rifle Pin
12	Rifle Pin	12	Rifle Pin
13	Rifle Pin	13	Rifle Pin
14	Rifle Pin	14	Rifle Pin
15	Rifle Pin	15	Rifle Pin
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17	Rifle Pin	17	Rifle Pin
18	Rifle Pin	18	Rifle Pin
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27	Rifle Pin	27	Rifle Pin
28	Rifle Pin	28	Rifle Pin
29	Rifle Pin	29	Rifle Pin
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31	Rifle Pin	31	Rifle Pin
32	Rifle Pin	32	Rifle Pin
33	Rifle Pin	33	Rifle Pin
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35	Rifle Pin	35	Rifle Pin
36	Rifle Pin	36	Rifle Pin
37	Rifle Pin	37	Rifle Pin
38	Rifle Pin	38	Rifle Pin
39	Rifle Pin	39	Rifle Pin
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41	Rifle Pin	41	Rifle Pin
42	Rifle Pin	42	Rifle Pin
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95	Rifle Pin	95	Rifle Pin
96	Rifle Pin	96	Rifle Pin
97	Rifle Pin	97	Rifle Pin
98	Rifle Pin	98	Rifle Pin
99	Rifle Pin	99	Rifle Pin
100	Rifle Pin	100	Rifle Pin

REMINGTON SCHOTTILL, No. 41

REMINENT

The Remington System with Wedge Extractor is a new and improved method of extracting bullets from wounds. It is a simple and easy method, and it is the only one that will extract bullets from wounds without causing any pain or damage to the wound. It is the only one that will extract bullets from wounds without causing any pain or damage to the wound. It is the only one that will extract bullets from wounds without causing any pain or damage to the wound.

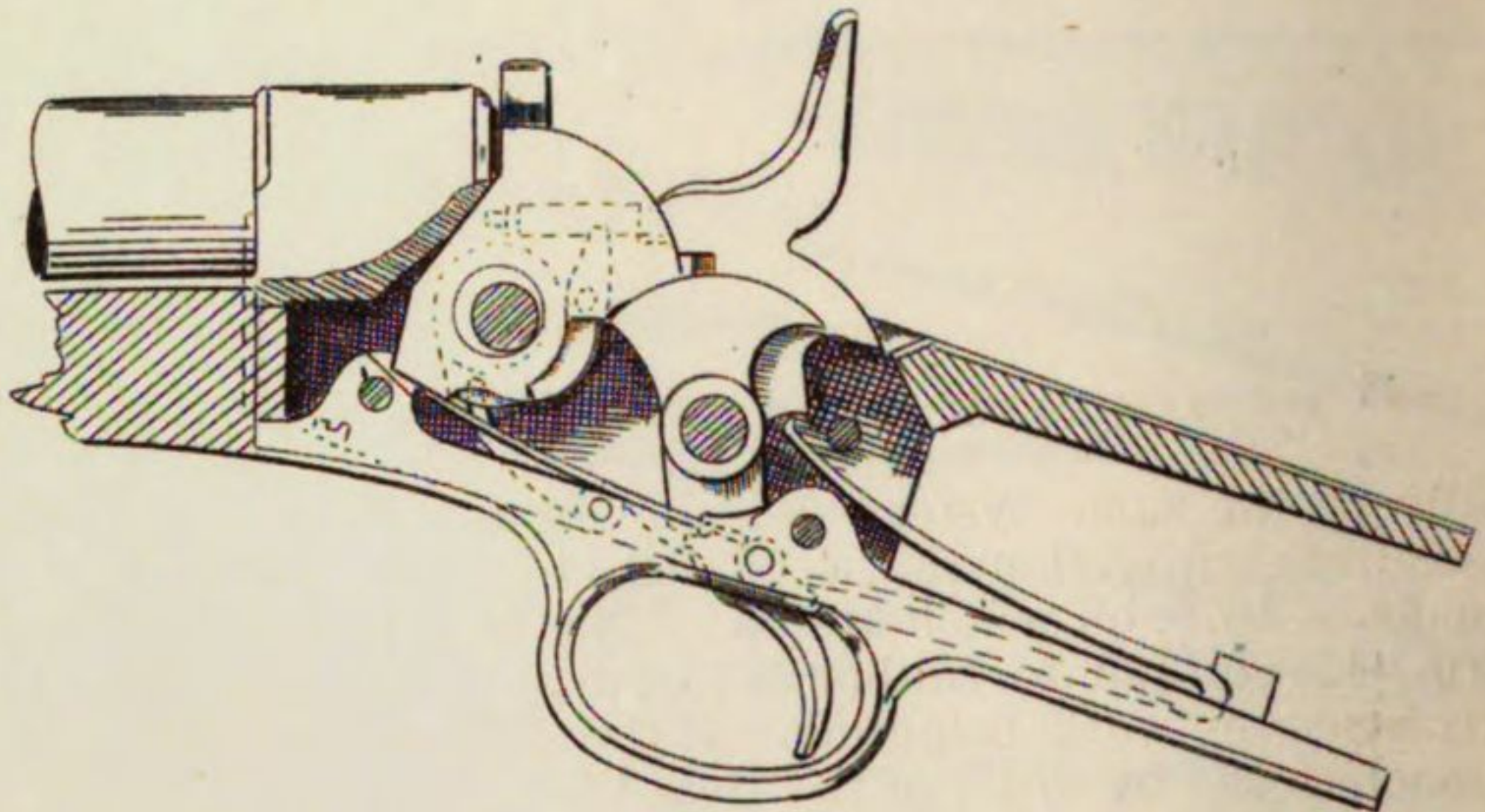
No. 88

REMINENT SYSTEM WITH WEDGE EXTRACTOR

REMINENT SYSTEM

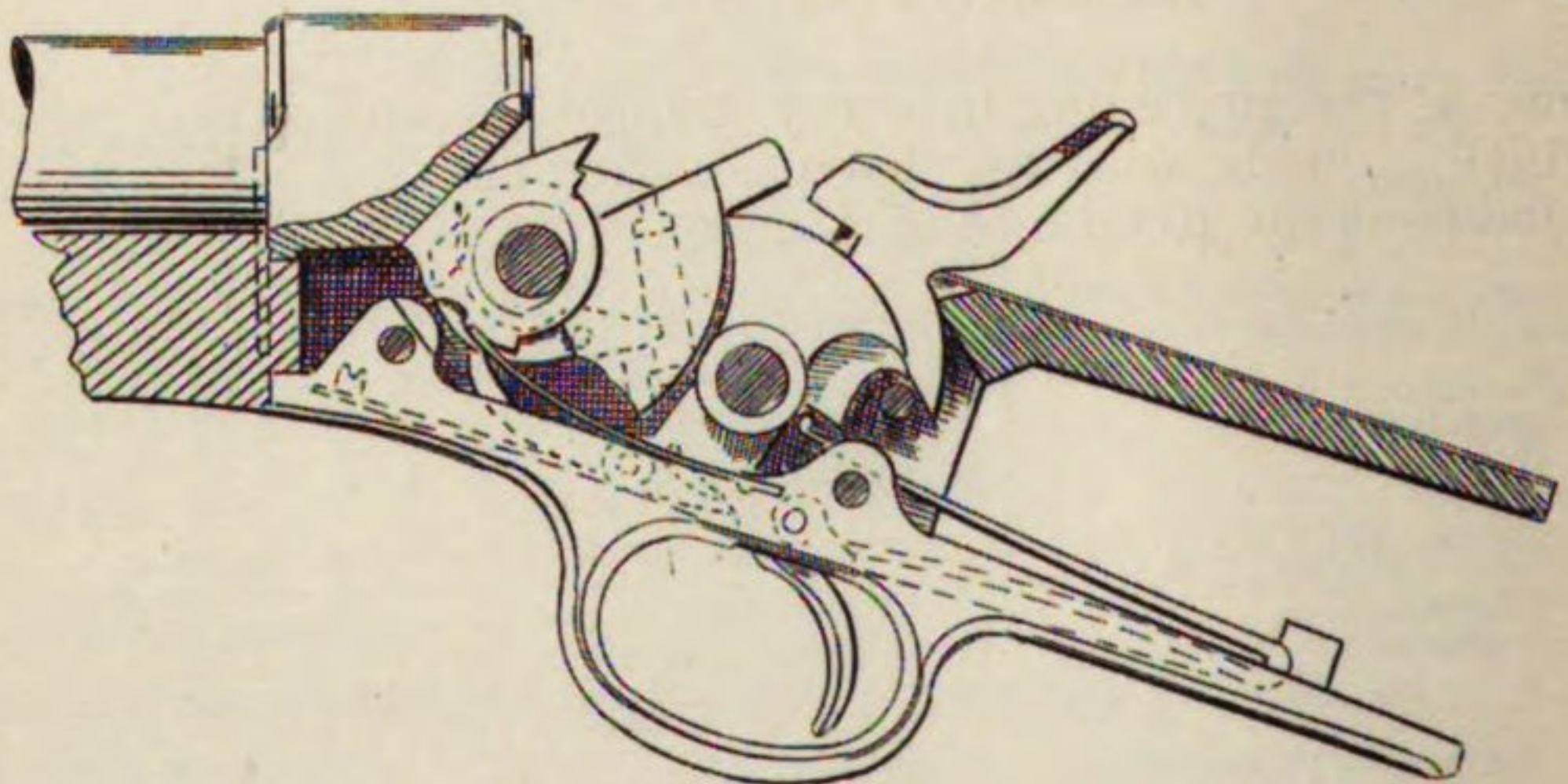
The Remington System with Wedge Extractor is a new and improved method of extracting bullets from wounds. It is a simple and easy method, and it is the only one that will extract bullets from wounds without causing any pain or damage to the wound. It is the only one that will extract bullets from wounds without causing any pain or damage to the wound. It is the only one that will extract bullets from wounds without causing any pain or damage to the wound.





Nº 86

REMINGTON SYSTEM WITH WEDGE EXTRACTOR



REMINGTON NAVY-RIFLE, No. 85.

Originally of the same system as is now in use in the United States Navy, resembling altogether that of Remington No. 41 and the experimental model of 1870, on which are based the reports from the field.

This arm was altered to caliber .45, and provided with the Ryder power extractor, the work being done at the National Armory, Springfield, Massachusetts, by order of the Board.

REMINGTON, No. 86.

The same as the preceding in every respect, except as to the main-spring, which is made with two leaves, as in Remington No. 19. This arm was made at the Remingtons' armory, Ilion, New York.

REMINGTON LOCKING-RIFLE, No. 82.

Six motions, viz: Cocked; opened; loaded; closed; full-cocked; fired.

Opened.—By bringing the hammer to the full-cock, and then swinging down the breech-block by its projecting thumb-piece. In the first part of its descent, its lower portion which is cam-shaped, rides over the front end of the lever-hook and lifts up the rear end, bearing the hook into the corresponding notch in the tumbler-end of the hammer. As its movement is continued, it strikes a long arm, extending forward from the right side of the sear, and throws the sear out of the full-cock notch. This permits the mainspring to throw forward the hammer against the back of the block, and to engage it fully with the lever-hook.

Closed.—As the block is closed in the manner usual to arms of this type, the hammer bears against it until it is shut, when the force of the mainspring throws the hammer forward and under the block to the extent permitted by the elongated shape of the lever-hook pin-hole. The hammer is now entirely supported by the lever-hook.

Locked.—The breech is thus locked against accidental discharge in loading, and is still further secured by the complete descent of the hammer under the block when the piece is fired.

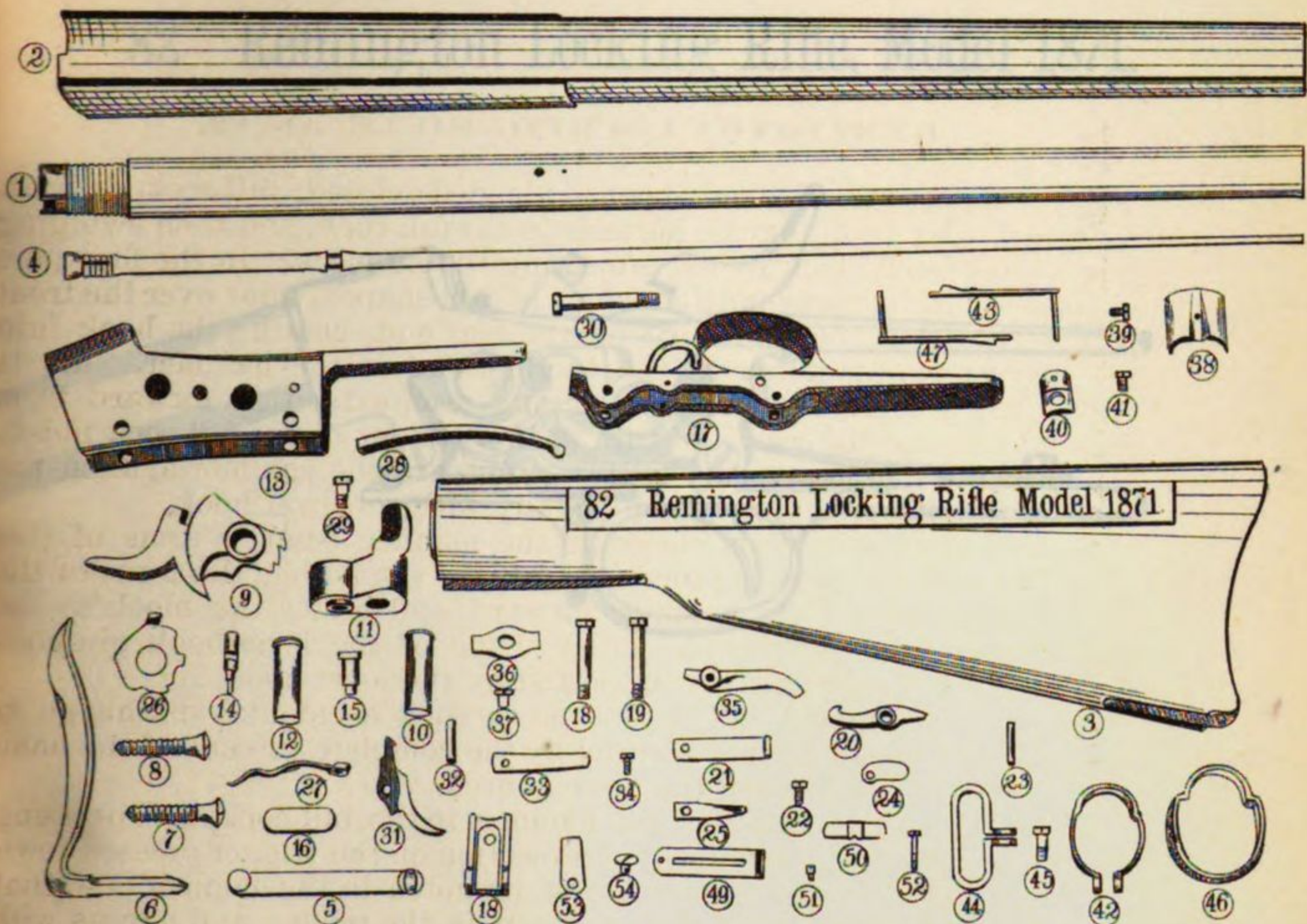
Fired.—By again bringing the hammer to the full-cock, and pressing on, the trigger in the usual way, a projection on the trigger presses down the hook end of the lever-hook out of its notch in the hammer; so that when the sear, which is on the same pin as the trigger and moves with it in this direction, is off the full-cock notch, the hammer may fall. As soon as released by the trigger from its notch in the hammer, the lever-hook is drawn forward into place by the friction-spring.

Extraction.—By a disk swinging on a hub formed around the pin-hole in the side of the breech-block and provided with one projection, against which a corresponding shoulder of the block strikes in opening, and another projection which engages with the rim of the cartridge.

Ejection.—By the acceleration impressed on the extractor by the end of a flat ejector-spring riding over a cam-shaped projection on its rim.

NOTE.—In opening the breech, the firing-pin in case of accidentally sticking forward, is loosened in its hole and is always drawn back, by engaging with a notched retractor, through the head of which, also notched, motion is imparted by a corresponding tooth on the rim of the extractor.

The friction-fly being pressed by its spring against the lower surface of the breech-block, enables the latter to remain closed against slight disturbances when the support of the hammer is withdrawn.



36 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock.
- 3 Butt Stock.

ELEVEN principal metallic parts not otherwise mentioned:

- 11 Breech Block,
- 14 Firing Pin,
- 15 Firing Pin Retractor,
- 13 Frame,
- 9 Hammer,
- 17 Guard,
- 20 Lever Hook,
- 24 Friction Fly,
- 31 Trigger,
- 35 Sear,

- 26 Extractor.

EIGHT Screws:

- 37 Button Screw,
- 18 Guard Screw,
- 19 Guard Screw,
- 22 Friction Fly Spring Scr.,
- 29 Main Spring Screw,
- 34 Sear Spring Screw,
- 30 Tang Screw,
- 41 Recoil Stud Screw.

SIX Pins:

- 12 Breech Block Pin,
- 13 Main Spring Stop Pin,
- 10 Hammer Pin,
- 23 Lever Hook Pin,

- 32 Trigger Pin,

- 28 Main Spring Friction Roll Pin.

FIVE Springs:

- 21 Friction Spring,
- 25 Friction Fly Spring,
- 28 Main Spring,
- 33 Sear Spring,
- 27 Ejector Spring.

FOUR other minor parts:

- 40 Recoil Stud,
- 36 Button,
- 40 Recoil Stud Dowel Pin,
- 28 Main Spring Friction Roll.

25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

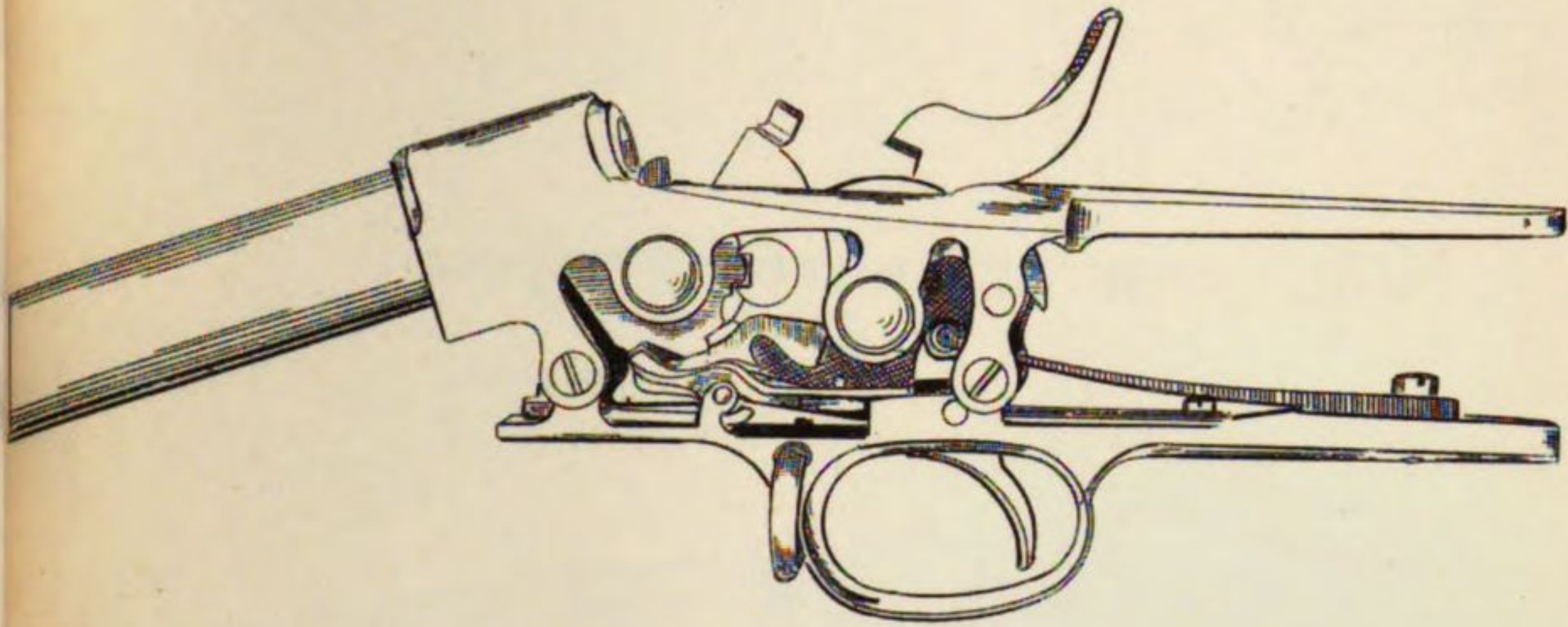
- 1 Barrel and Front Sight,
- 4 Ramrod,
- 6 Butt Plate,
- 7 Butt Plate Screw,
- 8 Butt Plate Screw,
- 38 Tip,
- 39 Tip Screw,
- 42 Upper Band,

- 43 Upper Band Spring,
- 44 Upper Band Swivel,
- 45 Upper Band Swivel Scr.,
- 46 Lower Band,
- 47 Lower Band Spring,
- 48 Rear Sight Base,
- 49 Rear Sight Leaf,
- 50 Rear Sight Leaf Slide,

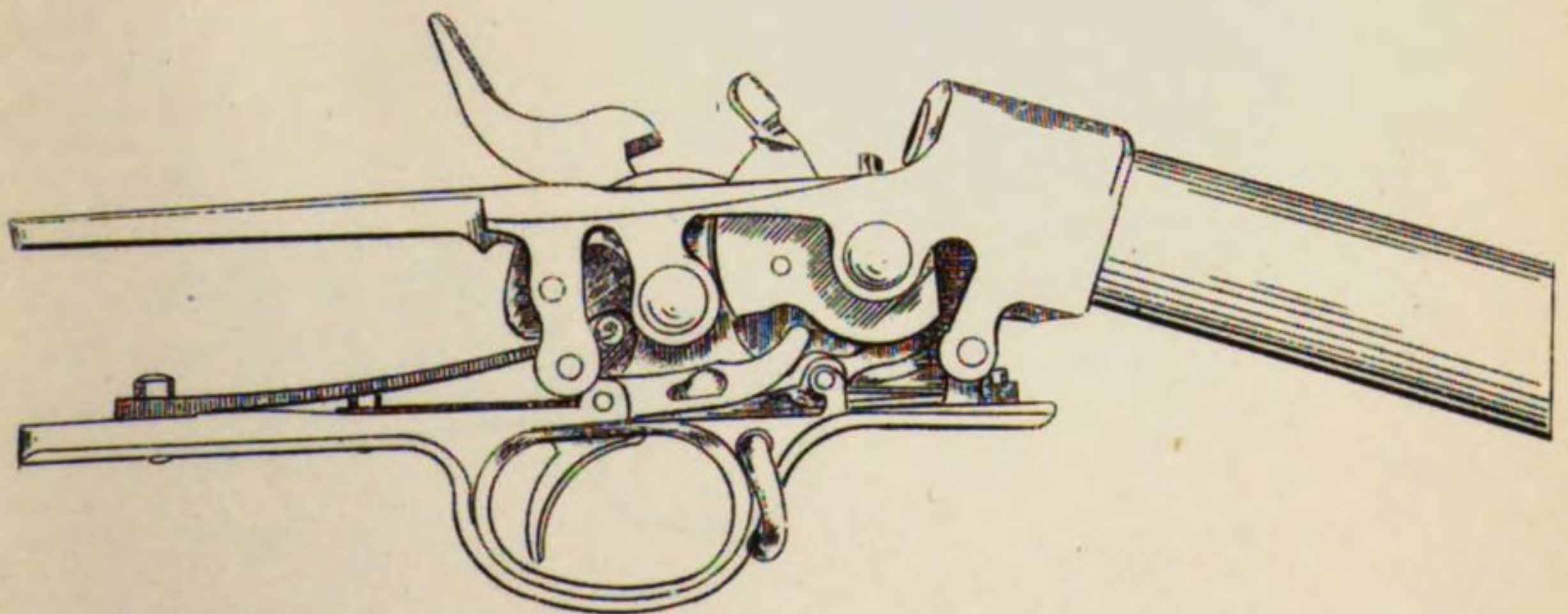
- 51 Rear Sight Leaf Screw,
- 52 Rear Sight Joint Screw,
- 53 Rear Sight Spring,
- 54 Rear Sight Base Screw,
- 17 Guard Swivel and Pin,
- 5 Ramrod Stop, Upper
- 16 Ramrod Stop, Lower

REMINGTON LOCKING RIFLE, No. 82.

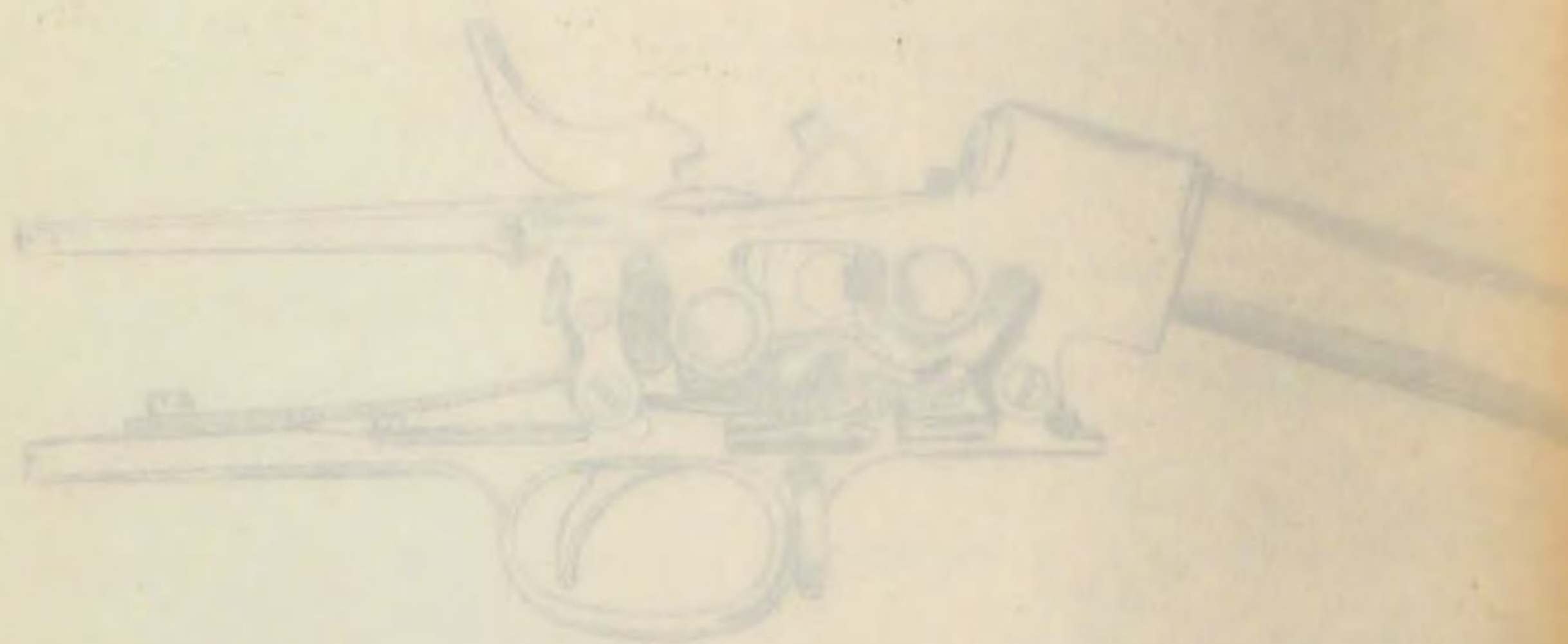
82 Remington Locking Rifle, Model 1871.



82 Remington Locking Rifle, Model 1871.



82 Remington Locking Rifle, Model 1871.

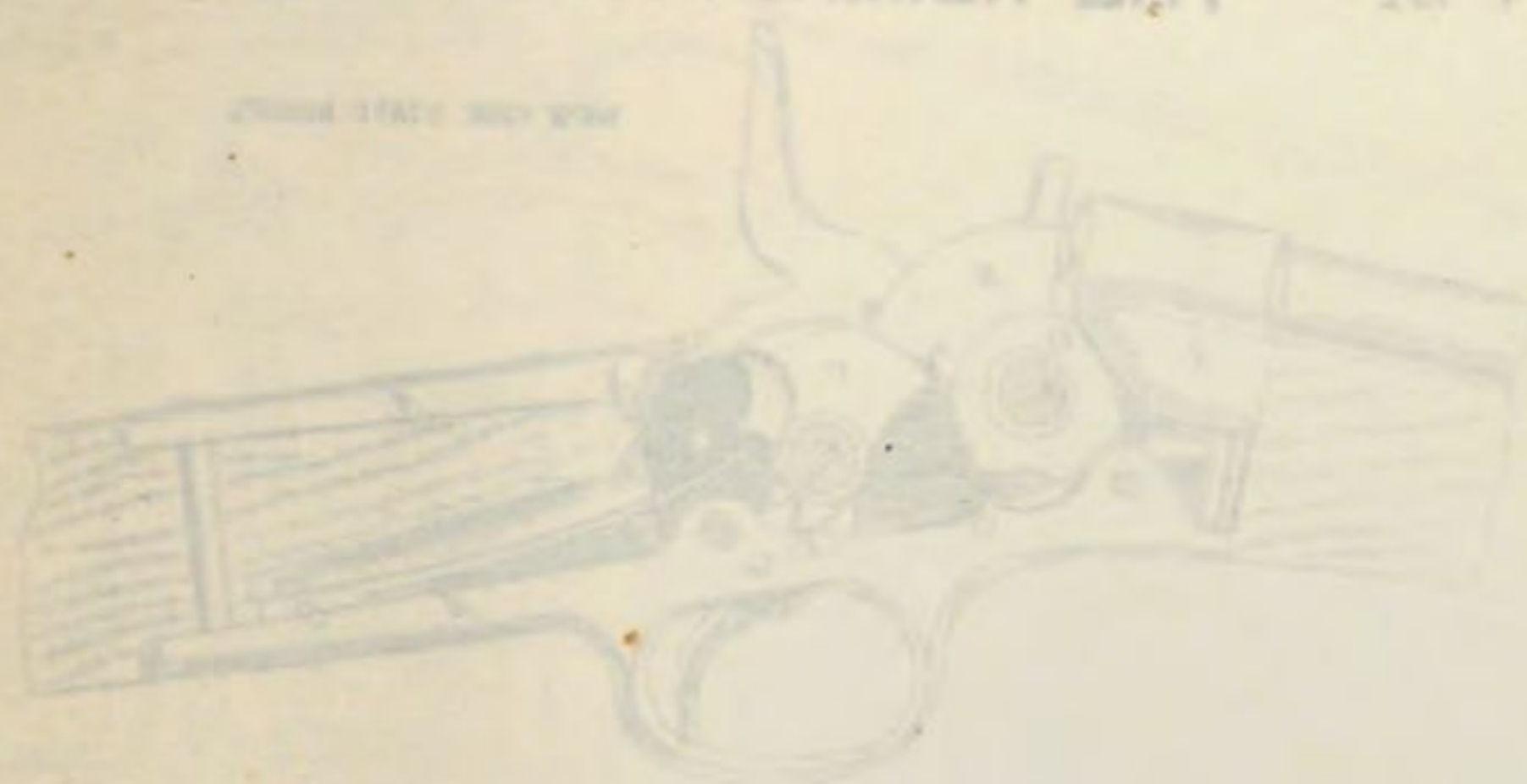


83 Remington Locking Rifle, Model 1871.



THE REMINGTON SYSTEM No. 1

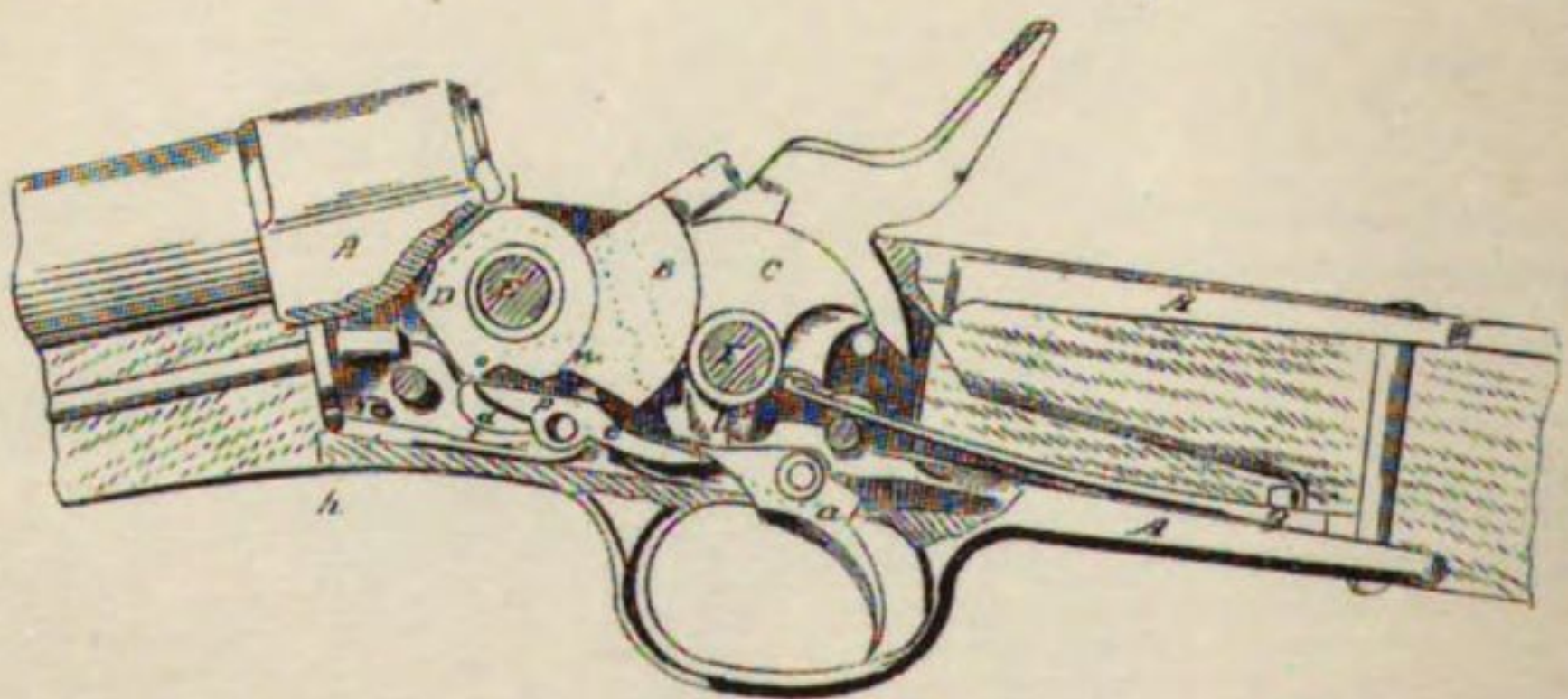
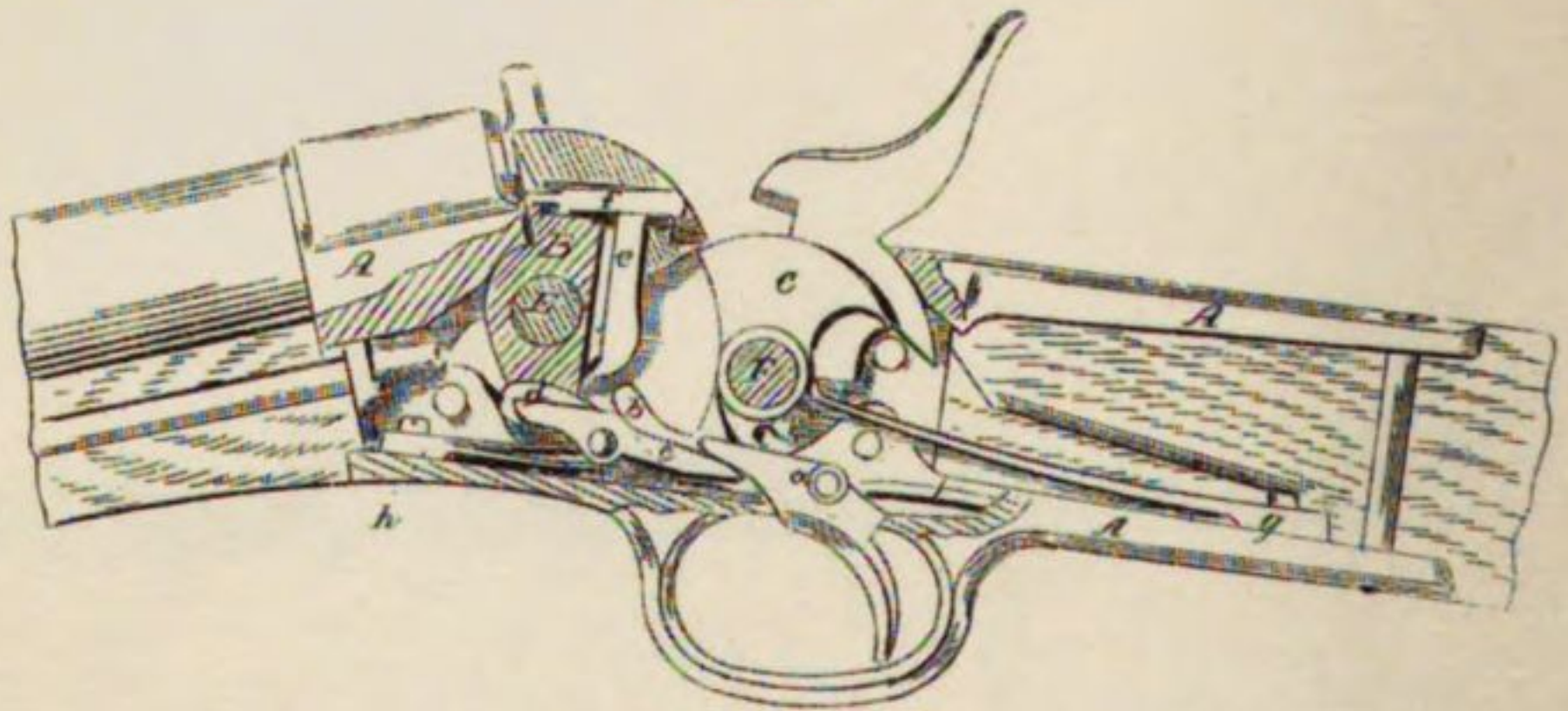
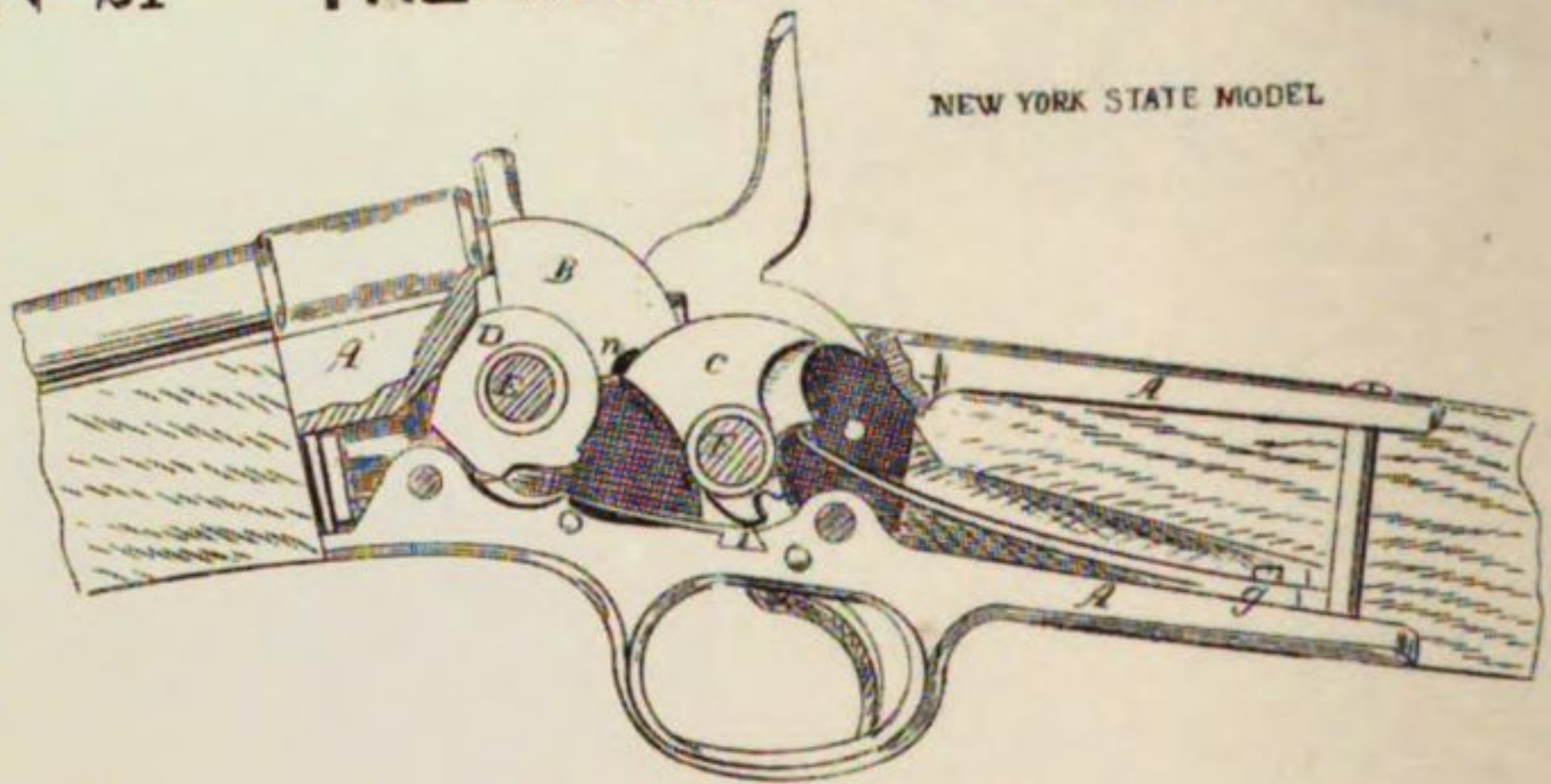
NEW YORK STATE PATENT

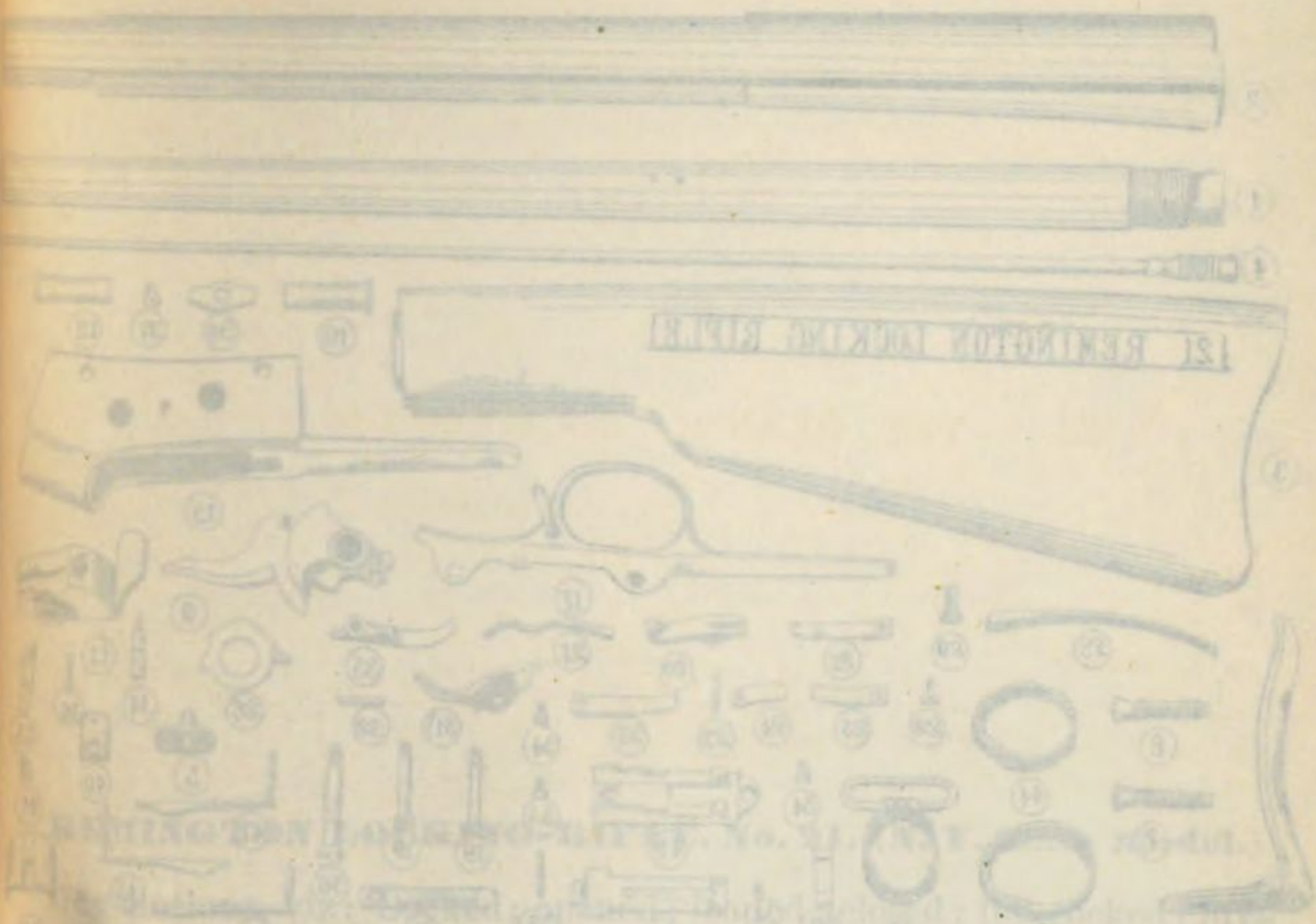


Nº21

THE REMINGTON SYSTEM

NEW YORK STATE MODEL



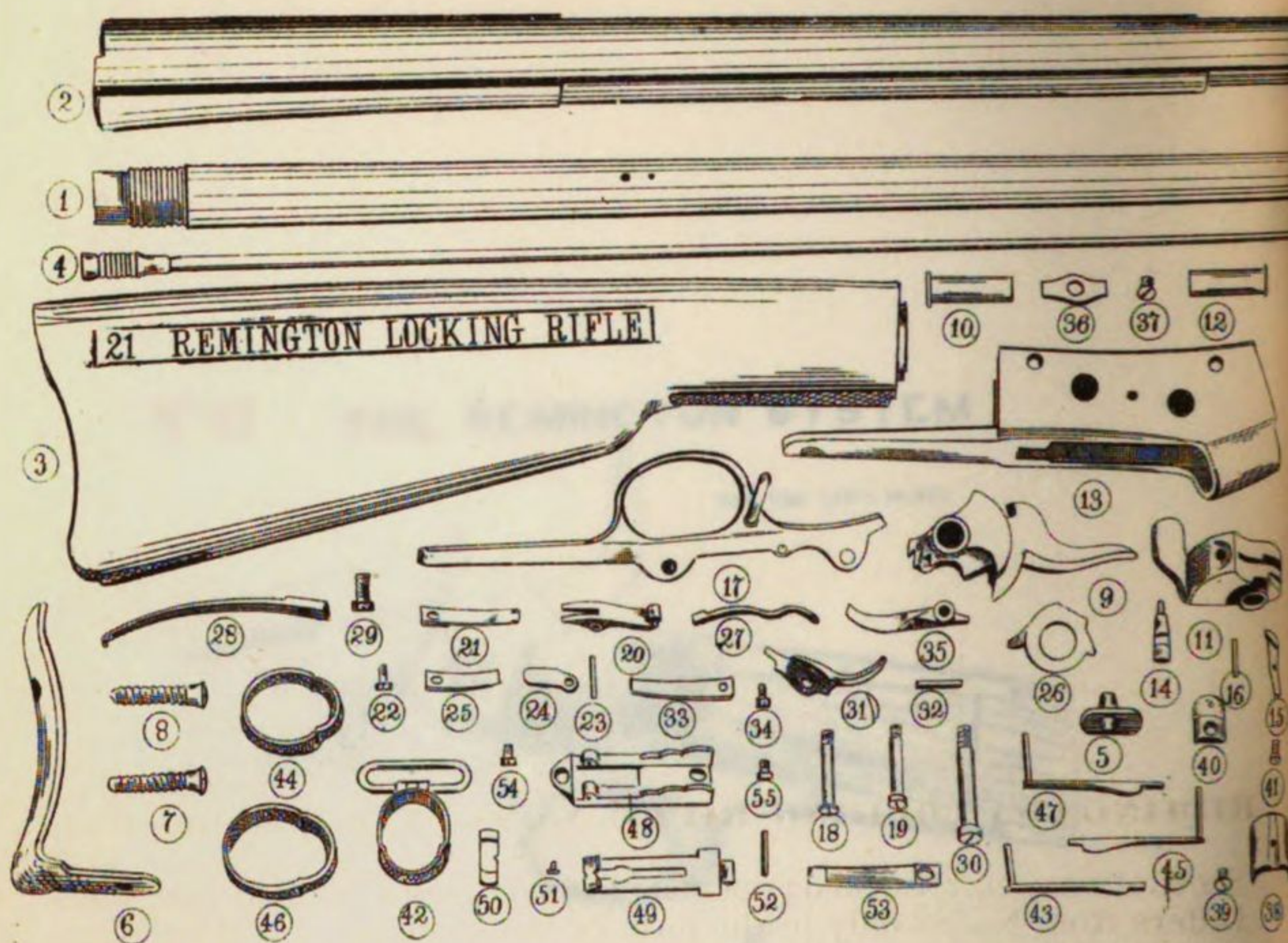


REMINGTON-UNION NO. 10

THE REMINGTON-UNION NO. 10 RIFLE IS A .25 CALIBRE RIFLE, DESIGNED BY THE REMINGTON-UNION RIFLE CO., NEW YORK. IT IS A VERY LIGHT AND PORTABLE RIFLE, AND IS SUITABLE FOR USE BY INFANTRY, CAVALRY, AND ARTILLERY. THE RIFLE IS MADE OF STEEL, AND IS VERY DURABLE. THE STOCK IS MADE OF WOOD, AND IS VERY COMFORTABLE TO HOLD. THE RIFLE IS VERY EASY TO LOAD, AND IS VERY ACCURATE. THE RIFLE IS VERY LIGHT, AND IS VERY PORTABLE. THE RIFLE IS VERY DURABLE, AND IS VERY SUITABLE FOR USE BY INFANTRY, CAVALRY, AND ARTILLERY.

PARTS NOT SPECIFIC TO THE RIFLE, OR COMMON TO ALL ARMS		PARTS SPECIFIC TO THE RIFLE	
1	Barrel	1	Barrel
2	Receiver	2	Receiver
3	Stock	3	Stock
4	Trigger	4	Trigger
5	Trigger Pin	5	Trigger Pin
6	Trigger Spring	6	Trigger Spring
7	Trigger Guard	7	Trigger Guard
8	Trigger Guard Spring	8	Trigger Guard Spring
9	Trigger Guard Pin	9	Trigger Guard Pin
10	Trigger Guard Screw	10	Trigger Guard Screw
11	Trigger Guard Nut	11	Trigger Guard Nut
12	Trigger Guard Washer	12	Trigger Guard Washer
13	Trigger Guard Lock	13	Trigger Guard Lock
14	Trigger Guard Pin	14	Trigger Guard Pin
15	Trigger Guard Spring	15	Trigger Guard Spring
16	Trigger Guard Screw	16	Trigger Guard Screw
17	Trigger Guard Nut	17	Trigger Guard Nut
18	Trigger Guard Washer	18	Trigger Guard Washer
19	Trigger Guard Lock	19	Trigger Guard Lock
20	Trigger Guard Pin	20	Trigger Guard Pin
21	Trigger Guard Spring	21	Trigger Guard Spring
22	Trigger Guard Screw	22	Trigger Guard Screw
23	Trigger Guard Nut	23	Trigger Guard Nut
24	Trigger Guard Washer	24	Trigger Guard Washer
25	Trigger Guard Lock	25	Trigger Guard Lock
26	Trigger Guard Pin	26	Trigger Guard Pin
27	Trigger Guard Spring	27	Trigger Guard Spring
28	Trigger Guard Screw	28	Trigger Guard Screw
29	Trigger Guard Nut	29	Trigger Guard Nut
30	Trigger Guard Washer	30	Trigger Guard Washer
31	Trigger Guard Lock	31	Trigger Guard Lock
32	Trigger Guard Pin	32	Trigger Guard Pin
33	Trigger Guard Spring	33	Trigger Guard Spring
34	Trigger Guard Screw	34	Trigger Guard Screw
35	Trigger Guard Nut	35	Trigger Guard Nut
36	Trigger Guard Washer	36	Trigger Guard Washer
37	Trigger Guard Lock	37	Trigger Guard Lock
38	Trigger Guard Pin	38	Trigger Guard Pin
39	Trigger Guard Spring	39	Trigger Guard Spring
40	Trigger Guard Screw	40	Trigger Guard Screw
41	Trigger Guard Nut	41	Trigger Guard Nut
42	Trigger Guard Washer	42	Trigger Guard Washer
43	Trigger Guard Lock	43	Trigger Guard Lock
44	Trigger Guard Pin	44	Trigger Guard Pin
45	Trigger Guard Spring	45	Trigger Guard Spring
46	Trigger Guard Screw	46	Trigger Guard Screw
47	Trigger Guard Nut	47	Trigger Guard Nut
48	Trigger Guard Washer	48	Trigger Guard Washer
49	Trigger Guard Lock	49	Trigger Guard Lock
50	Trigger Guard Pin	50	Trigger Guard Pin
51	Trigger Guard Spring	51	Trigger Guard Spring
52	Trigger Guard Screw	52	Trigger Guard Screw
53	Trigger Guard Nut	53	Trigger Guard Nut
54	Trigger Guard Washer	54	Trigger Guard Washer
55	Trigger Guard Lock	55	Trigger Guard Lock
56	Trigger Guard Pin	56	Trigger Guard Pin
57	Trigger Guard Spring	57	Trigger Guard Spring
58	Trigger Guard Screw	58	Trigger Guard Screw
59	Trigger Guard Nut	59	Trigger Guard Nut
60	Trigger Guard Washer	60	Trigger Guard Washer
61	Trigger Guard Lock	61	Trigger Guard Lock
62	Trigger Guard Pin	62	Trigger Guard Pin
63	Trigger Guard Spring	63	Trigger Guard Spring
64	Trigger Guard Screw	64	Trigger Guard Screw
65	Trigger Guard Nut	65	Trigger Guard Nut
66	Trigger Guard Washer	66	Trigger Guard Washer
67	Trigger Guard Lock	67	Trigger Guard Lock
68	Trigger Guard Pin	68	Trigger Guard Pin
69	Trigger Guard Spring	69	Trigger Guard Spring
70	Trigger Guard Screw	70	Trigger Guard Screw
71	Trigger Guard Nut	71	Trigger Guard Nut
72	Trigger Guard Washer	72	Trigger Guard Washer
73	Trigger Guard Lock	73	Trigger Guard Lock
74	Trigger Guard Pin	74	Trigger Guard Pin
75	Trigger Guard Spring	75	Trigger Guard Spring
76	Trigger Guard Screw	76	Trigger Guard Screw
77	Trigger Guard Nut	77	Trigger Guard Nut
78	Trigger Guard Washer	78	Trigger Guard Washer
79	Trigger Guard Lock	79	Trigger Guard Lock
80	Trigger Guard Pin	80	Trigger Guard Pin
81	Trigger Guard Spring	81	Trigger Guard Spring
82	Trigger Guard Screw	82	Trigger Guard Screw
83	Trigger Guard Nut	83	Trigger Guard Nut
84	Trigger Guard Washer	84	Trigger Guard Washer
85	Trigger Guard Lock	85	Trigger Guard Lock
86	Trigger Guard Pin	86	Trigger Guard Pin
87	Trigger Guard Spring	87	Trigger Guard Spring
88	Trigger Guard Screw	88	Trigger Guard Screw
89	Trigger Guard Nut	89	Trigger Guard Nut
90	Trigger Guard Washer	90	Trigger Guard Washer
91	Trigger Guard Lock	91	Trigger Guard Lock
92	Trigger Guard Pin	92	Trigger Guard Pin
93	Trigger Guard Spring	93	Trigger Guard Spring
94	Trigger Guard Screw	94	Trigger Guard Screw
95	Trigger Guard Nut	95	Trigger Guard Nut
96	Trigger Guard Washer	96	Trigger Guard Washer
97	Trigger Guard Lock	97	Trigger Guard Lock
98	Trigger Guard Pin	98	Trigger Guard Pin
99	Trigger Guard Spring	99	Trigger Guard Spring
100	Trigger Guard Screw	100	Trigger Guard Screw

REMINGTON-UNION NO. 10



35 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:		35	Sear,	13	Main Spring Stop Pin,	
2	Tip Stock,	26	Extractor.	10	Hammer Pin,	
3	Butt Stock.	EIGHT Screws:			23	Lever Hook Pin,
ELEVEN principal metallic parts not otherwise mentioned:		37	Button Screw,	32	Trigger Pin.	
11	Breech Block,	18	Guard Screw,	FIVE Springs:		
14	Firing Pin,	19	Guard Screw,	21	Friction Spring,	
15	Firing Pin Retractor,	22	Friction Fly Spring Scr.,	25	Friction Fly Spring,	
13	Frame,	29	Main Spring Screw,	28	Main Spring,	
9	Hammer,	34	Sear Spring Screw,	33	Sear Spring,	
17	Guard,	30	Tang Screw,	27	Ejector Spring.	
20	Lever Hook,	41	Recoil Stud Screw.	THREE other minor parts:		
24	Friction Fly,	SIX Pins:			40	Recoil Stud,
31	Trigger,	12	Breech Block Pin,	36	Button,	
		16	Firing Pin Retractor Pin,	40	Recoil Stud Dowel Pin.	

27 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

1	Barrel and Front Sight,	43	Upper Band Spring,	51	Rear Sight Leaf Screw,
4	Ramrod,	44	Middle Band,	52	Rear Sight Joint Pin,
6	Butt Plate,	45	Middle Band Spring,	53	Rear Sight Spring,
7	Butt Plate Screw,	46	Lower Band,	54	Rear Sight Base Screw,
8	Butt Plate Screw,	47	Lower Band Spring,	55	Rear Sight Base Screw,
38	Tip,	48	Rear Sight Base,	17	Guard Swivel and Pin,
39	Tip Screw,	49	Rear Sight Leaf,	5	Ramrod Stop.
42	Upper Band, Swivel & Pin,	50	Rear Sight Leaf Slide,		

REMINGTON LOCKING RIFLE, No. 21.

REMINGTON LOCKING-RIFLE, No. 21. (N. Y. State model.)

Six motions, viz: Cocked; opened; loaded; closed; full-cocked; fired.

Differs from No. 82 only in the form of the firing-pin retractor, which is a straight lever pivoted in a groove in the lower part of the breech-block, its upper end engaging with a notch in the firing-pin, and the lower end projecting from the back of the block, and so formed that in riding over the friction-fly in opening, it will be closed into the block, thus drawing back its upper end and with it the firing-pin.

THOMAS, No. 44.

Six motions, viz: Cocked; opened; loaded; closed; full-cocked; fired.

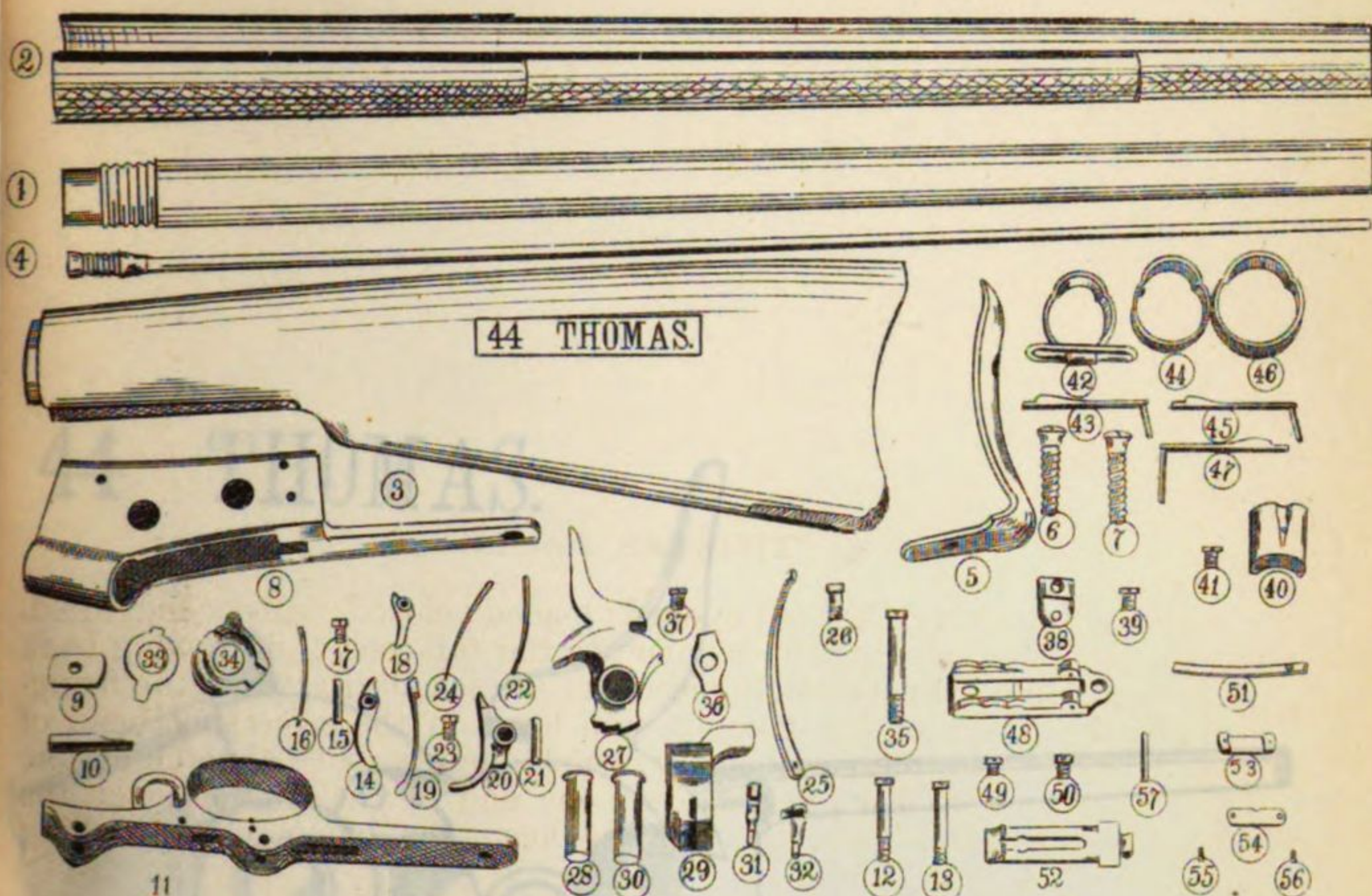
Opened.—By bringing the hammer to the full-cock and drawing back the breech-block by its thumb-piece; as it descends it retracts the firing-pin by the action of the hammer-stop lever on the projecting head of the retractor, the notched body of which engages with a notch on the firing-pin, and it also presses down one end of the friction-lever, the other end of which locks the sear and keeps the hammer from falling until the breech is closed.

Closed.—By reversing the movement of the block; as it rises, a projection on its lower surface trips the friction-lever and throws the sear out of its notch, allowing the hammer to fall forward against the back of the block, and to rest on it until the breech is fully closed. It then passes under the block until stopped by striking against the projecting head of the retractor called the hammer-stop, which has been pushed out into place by its lever during the upward movement of the block. The block is thereby secured against the effect of any accidental discharge in closing, but it is afterward more completely—

Locked.—By the descent of the hammer beneath the breech-block when the piece is fired.

Fired.—By a center-lock of the usual pattern.

Extraction and ejection are essentially the same as shown in Remington, No. 21.



37 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

TWELVE principal metallic parts not otherwise mentioned:

- 8 Frame,
- 29 Breech Block,
- 31 Firing Pin,
- 32 Firing Pin Retractor,
- 32 Hammer Stop,
- 33 Hammer Stop Lever,
- 27 Hammer,
- 11 Guard,
- 14 Friction Lever,
- 18 Friction Lever Fly,

- 34 Extractor,
- 20 Trigger.

EIGHT Screws:

- 37 Button Screw,
- 12 Guard Screw,
- 13 Guard Screw,
- 17 Friction Lever Spr'g Scr.,
- 23 Trigger Spring Screw,
- 26 Main Spring Screw,
- 35 Tang Screw,
- 39 Recoil Stud Screw.

SIX Pins:

- 30 Breech Block Pin,
- 28 Hammer Pin,
- 10 Main Spring Stop Pin,

- 15 Friction Lever Pin,
- 21 Trigger Pin,
- 25 Main Spring Friction Roll Pin.

FIVE Springs:

- 16 Friction Lever Spring,
- 19 Extractor Spring,
- 22 Trigger Spring,
- 24 Friction Fly Spring,
- 25 Main Spring.

FOUR other minor parts:

- 36 Button,
- 38 Recoil Stud,
- 38 Recoil Stud Dowel Pin,
- 25 Main Spring Friction Roll.

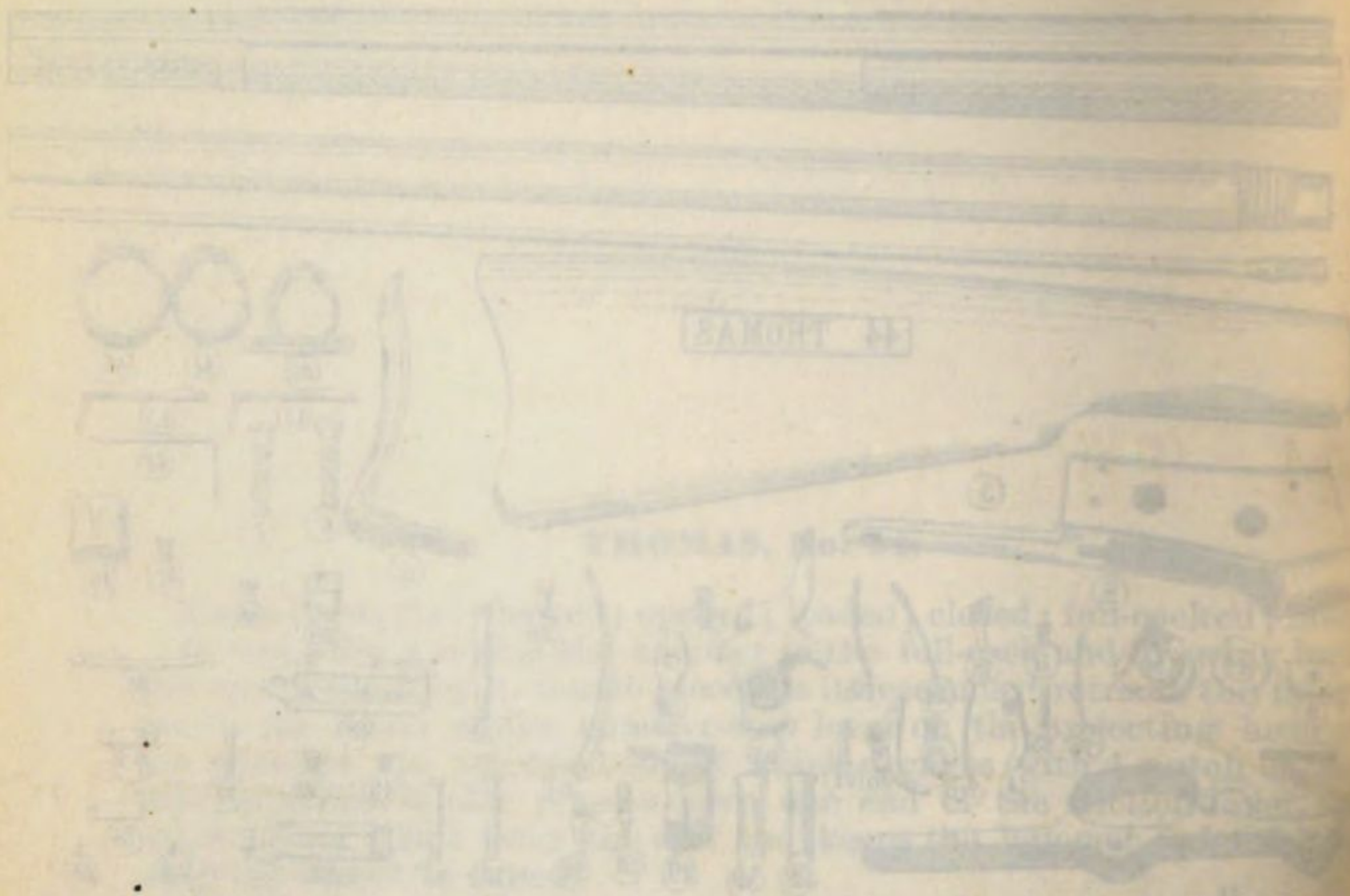
29 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 40 Tip,
- 41 Tip Screw,
- 42 Upper Band, Swivel & Pin,
- 43 Upper Band Spring,

- 44 Middle Band,
- 45 Middle Band Spring,
- 46 Lower Band,
- 47 Lower Band Spring,
- 48 Rear Sight Base,
- 49 Rear Sight Base Screw,
- 50 Rear Sight Base Screw,
- 51 Rear Sight Spring,
- 52 Rear Sight Leaf,

- 53 Rear Sight Leaf Slide,
- 54 Rear Sight Leaf Slide Cap,
- 55 Rear Sight Leaf Slide Cap Screw,
- 56 Rear Sight Leaf Slide Cap Screw,
- 57 Rear Sight Joint Pin,
- 9 Ramrod Stop,
- 11 Guard Swivel and Pin.

THOMAS, No. 44.



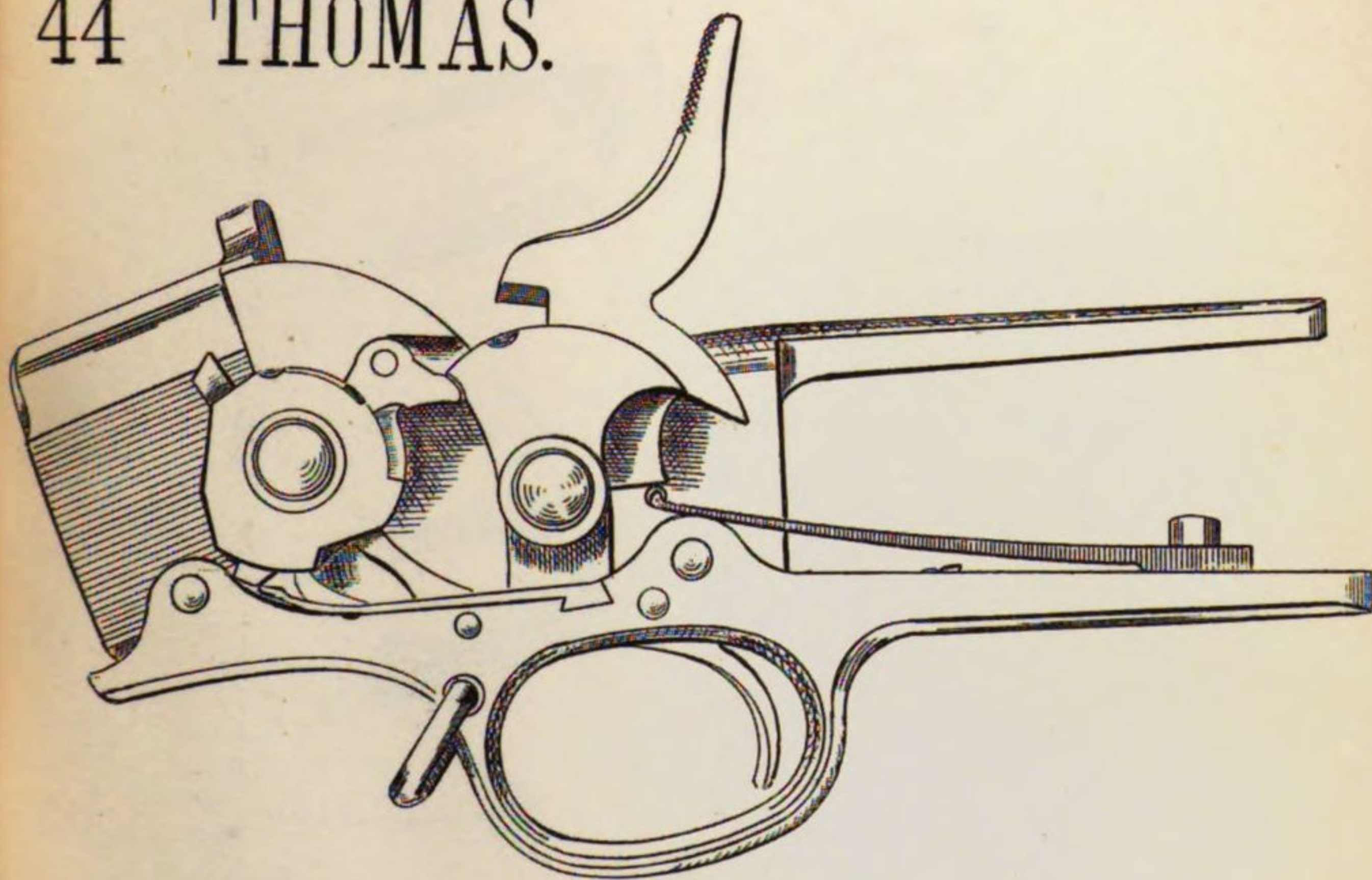
THOMAS

IN PARTS NOT EXISTING TO THE EXTENT OF CORRECTION TO ALL PARTS

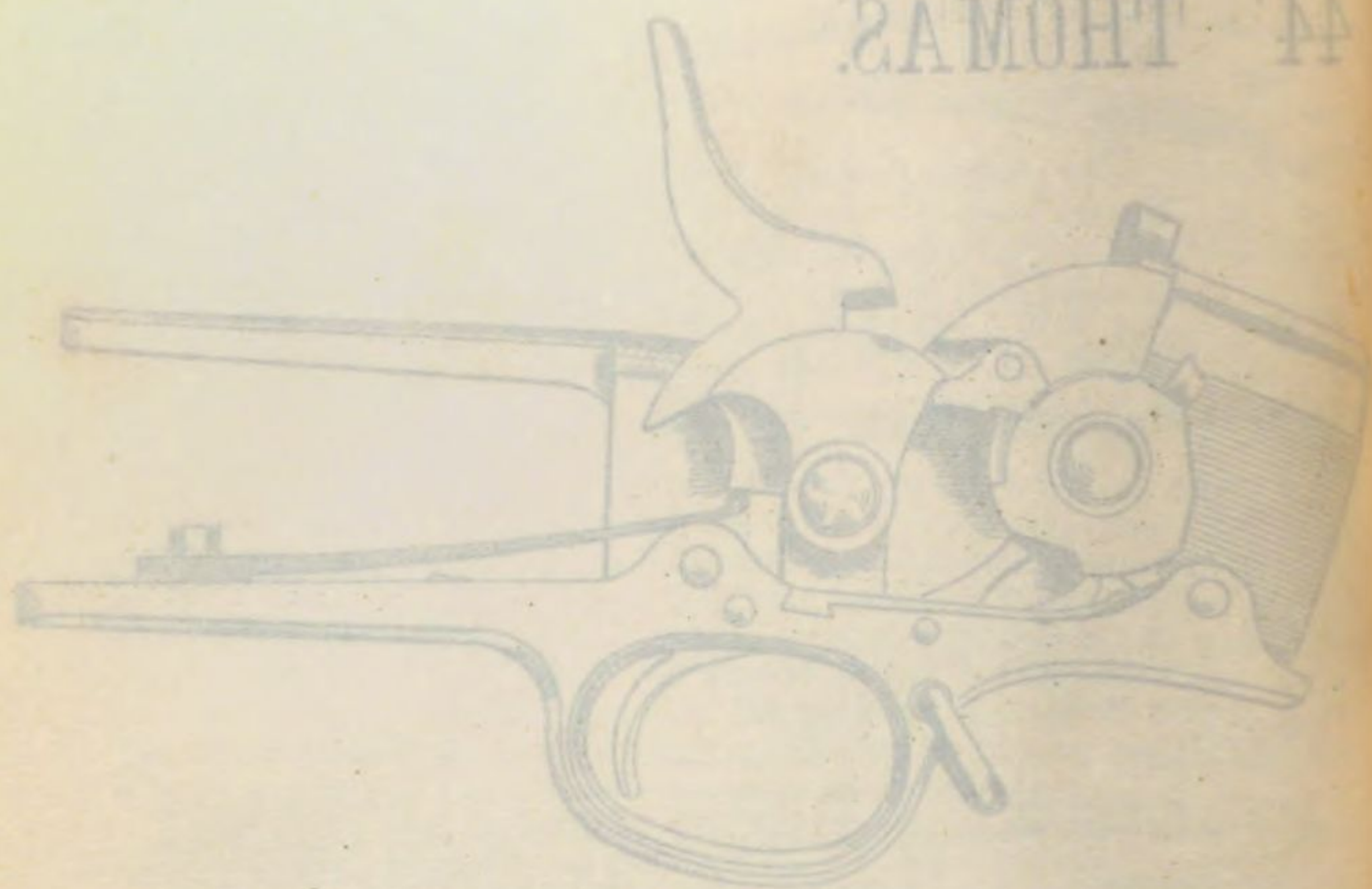
1	Locomotive	41	Mobile hand
2	Locomotive	42	Mobile hand spring
3	Locomotive	43	Lower hand
4	Locomotive	44	Lower hand spring
5	Locomotive	45	Lower hand spring
6	Locomotive	46	Lower hand spring
7	Locomotive	47	Lower hand spring
8	Locomotive	48	Lower hand spring
9	Locomotive	49	Lower hand spring
10	Locomotive	50	Lower hand spring
11	Locomotive	51	Lower hand spring
12	Locomotive	52	Lower hand spring
13	Locomotive	53	Lower hand spring
14	Locomotive	54	Lower hand spring
15	Locomotive	55	Lower hand spring
16	Locomotive	56	Lower hand spring
17	Locomotive	57	Lower hand spring
18	Locomotive	58	Lower hand spring
19	Locomotive	59	Lower hand spring
20	Locomotive	60	Lower hand spring
21	Locomotive	61	Lower hand spring
22	Locomotive	62	Lower hand spring
23	Locomotive	63	Lower hand spring
24	Locomotive	64	Lower hand spring
25	Locomotive	65	Lower hand spring
26	Locomotive	66	Lower hand spring
27	Locomotive	67	Lower hand spring
28	Locomotive	68	Lower hand spring
29	Locomotive	69	Lower hand spring
30	Locomotive	70	Lower hand spring
31	Locomotive	71	Lower hand spring
32	Locomotive	72	Lower hand spring
33	Locomotive	73	Lower hand spring
34	Locomotive	74	Lower hand spring
35	Locomotive	75	Lower hand spring
36	Locomotive	76	Lower hand spring
37	Locomotive	77	Lower hand spring
38	Locomotive	78	Lower hand spring
39	Locomotive	79	Lower hand spring
40	Locomotive	80	Lower hand spring
41	Locomotive	81	Lower hand spring
42	Locomotive	82	Lower hand spring
43	Locomotive	83	Lower hand spring
44	Locomotive	84	Lower hand spring
45	Locomotive	85	Lower hand spring
46	Locomotive	86	Lower hand spring
47	Locomotive	87	Lower hand spring
48	Locomotive	88	Lower hand spring
49	Locomotive	89	Lower hand spring
50	Locomotive	90	Lower hand spring
51	Locomotive	91	Lower hand spring
52	Locomotive	92	Lower hand spring
53	Locomotive	93	Lower hand spring
54	Locomotive	94	Lower hand spring
55	Locomotive	95	Lower hand spring
56	Locomotive	96	Lower hand spring
57	Locomotive	97	Lower hand spring
58	Locomotive	98	Lower hand spring
59	Locomotive	99	Lower hand spring
60	Locomotive	100	Lower hand spring

THOMAS

44 THOMAS.



44 THOMAS SAMOIT



THE REMINGTON-RYDER SYSTEM

FIGURE 1. THE LOCK PART

No. 22

FIGURE 2. THE LOCK PART



FIGURE 3. THE LOCK PART



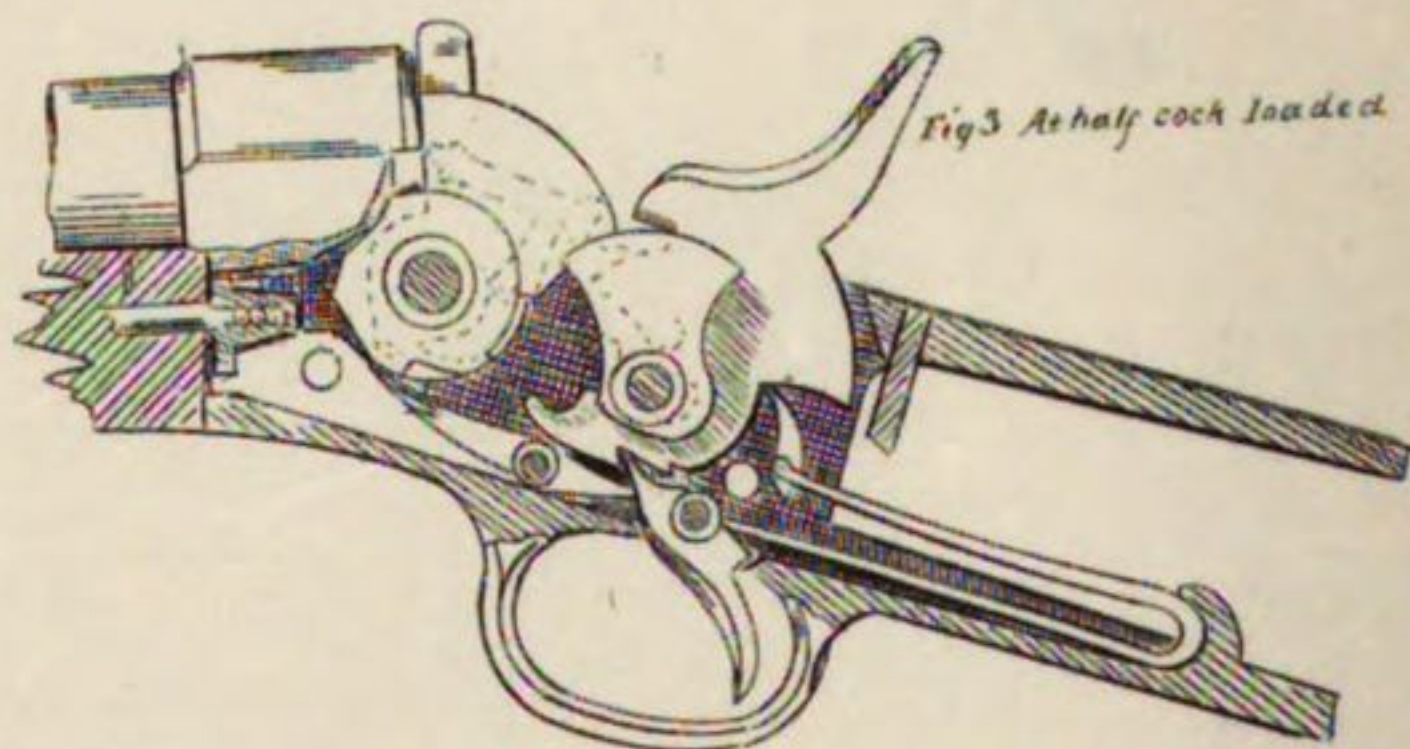
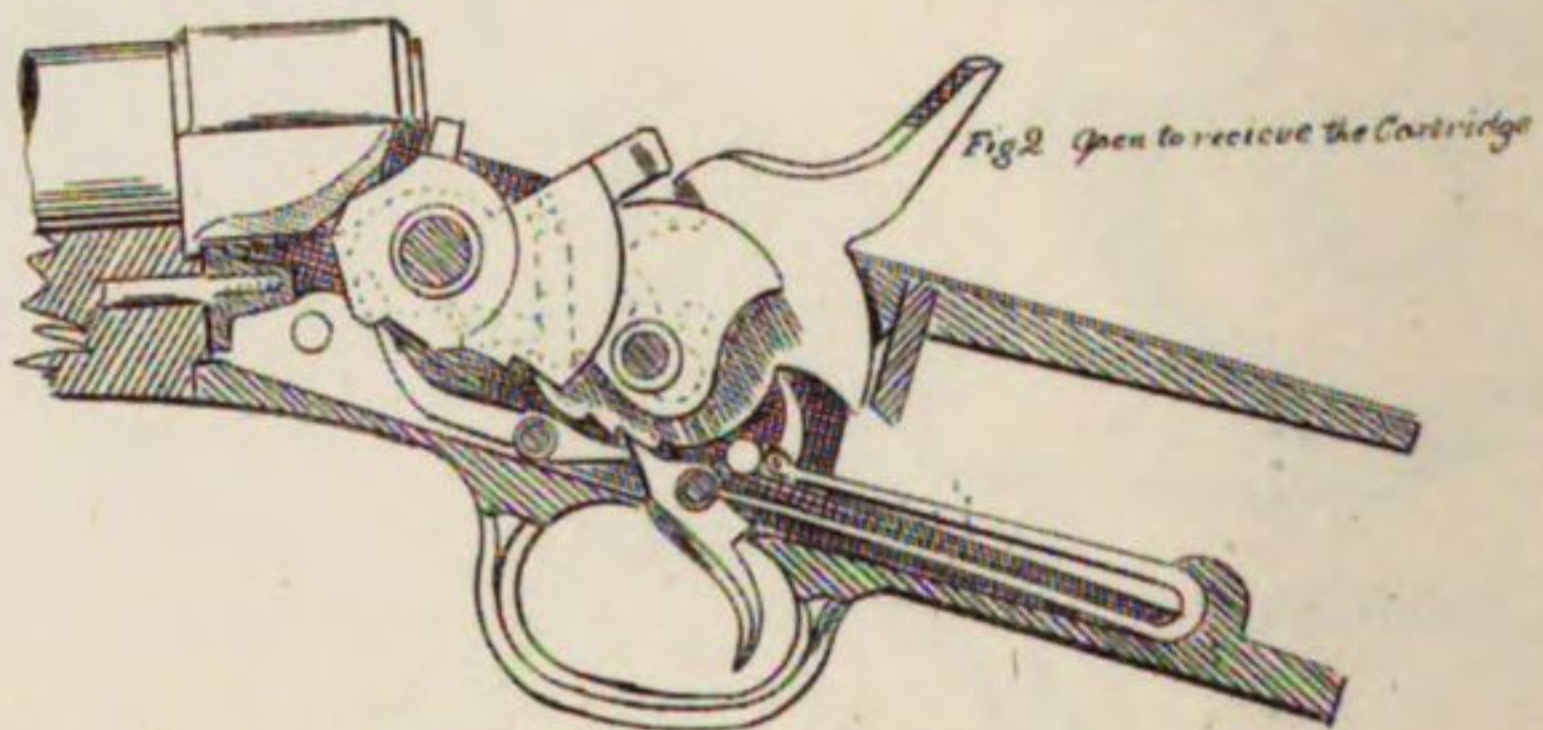
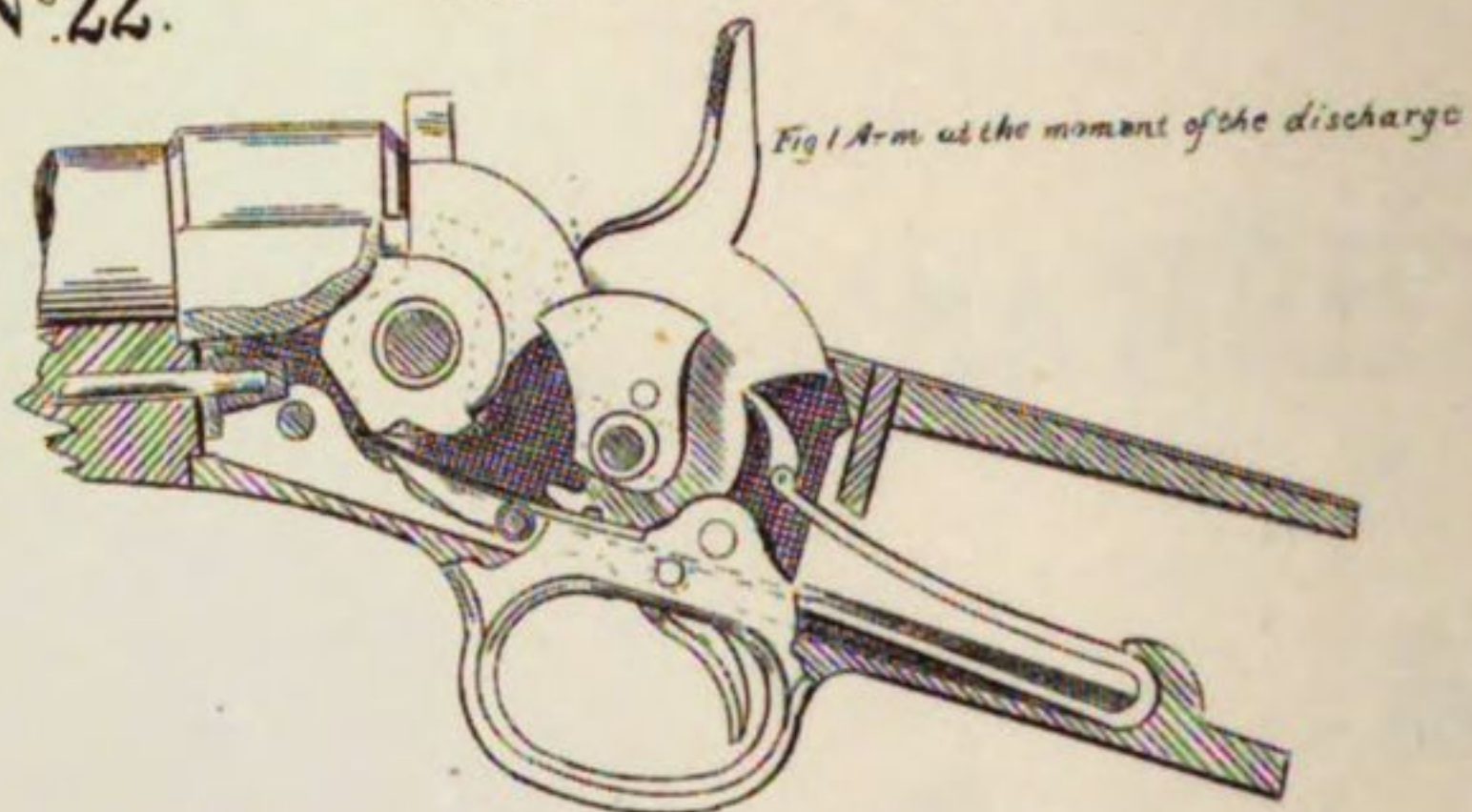
FIGURE 4. THE LOCK PART

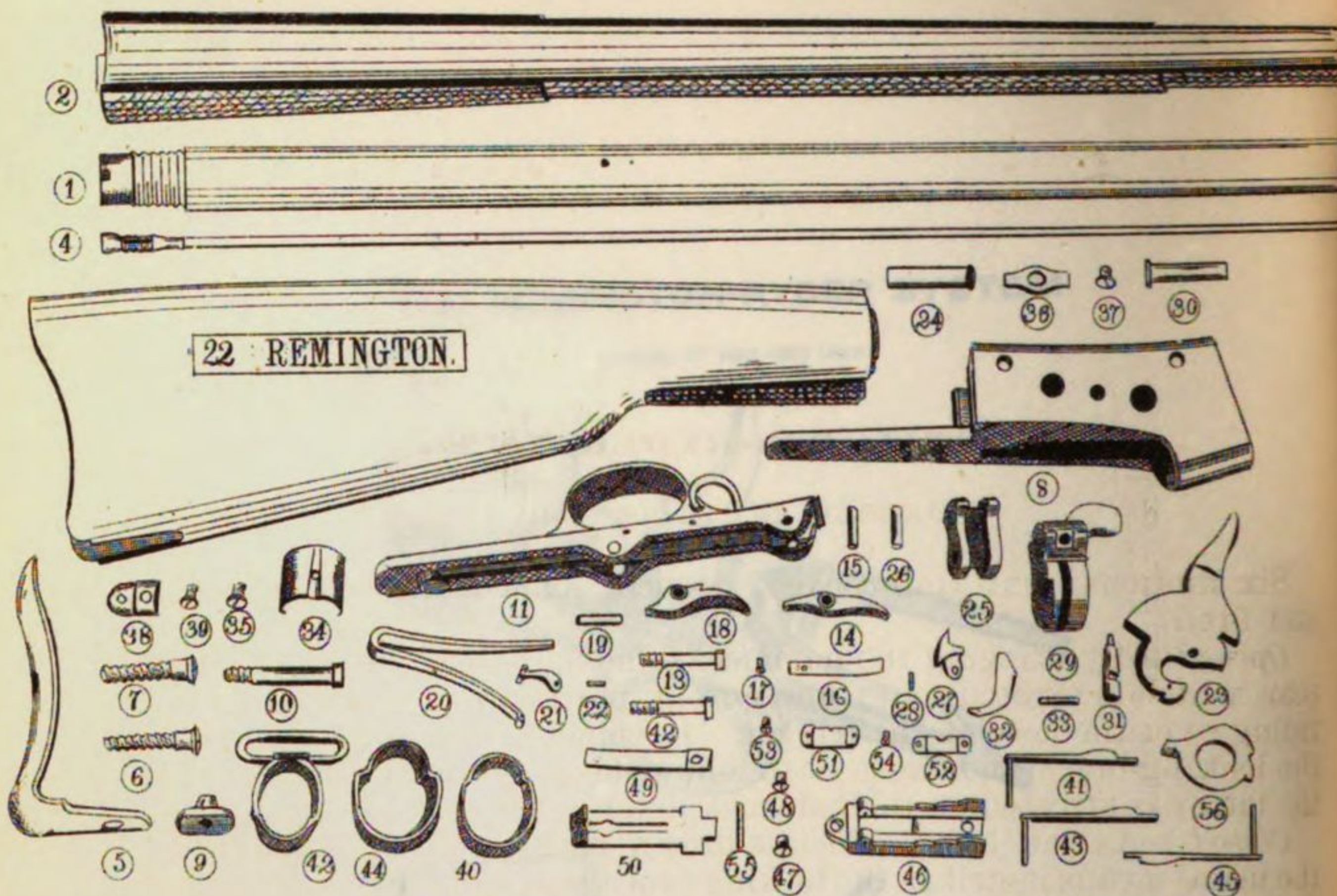


THE REMINGTON-RYDER SYSTEM

N^o 22.

LOADING AT HALF COCK ONLY





33 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

TWELVE principal metallic parts not otherwise mentioned:

- 29 Breech Block,
- 31 Firing Pin,
- 32 Firing Pin Retractor,
- 8 Frame,
- 23 Hammer,
- 11 Guard,
- 14 Friction Lever,
- 18 Trigger,
- 25 Locking Brace,

- 27 Locking Brace Sear,
- 56 Extractor,
- 21 Main Spring Swivel.

SIX Screws:

- 37 Button Screw,
- 12 Guard Screw,
- 13 Guard Screw,
- 17 Ejector Spring Screw,
- 10 Tang Screw,
- 39 Recoil Stud Screw.

EIGHT Pins:

- 30 Hammer Pin,
- 33 Firing Pin Retractor Pin,
- 24 Breech Block Pin,

- 15 Friction Lever Pin,
- 19 Trigger Pin,
- 22 Main Spring Swivel Pin,
- 26 Locking Brace Pin,
- 28 Locking Brace Sear Pin.

Two Springs:

- 16 Ejector Spring,
- 20 Main Spring and Trigger Spring (combined).

THREE other minor parts:

- 38 Recoil Stud,
- 38 Recoil Stud Dowel Pin,
- 36 Button.

29 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 34 Tip,
- 35 Tip Screw,
- 40 Upper Band, Swivel & Pin,
- 41 Upper Band Spring,

- 42 Middle Band,
- 43 Middle Band Spring,
- 44 Lower Band,
- 45 Lower Band Spring,
- 46 Rear Sight Base,
- 47 Rear Sight Base Screw,
- 48 Rear Sight Base Screw,
- 49 Rear Sight Spring,
- 50 Rear Sight Leaf,

- 51 Rear Sight Leaf Slide,
- 52 Rear Sight Leaf Slide Cap,
- 53 Rear Sight Leaf Slide Cap Screw,
- 54 Rear Sight Leaf Slide Cap Screw,
- 55 Rear Sight Joint Pin,
- 11 Guard Swivel and Pin,
- 9 Ramrod Stop.

REMINGTON, No. 22.

REMINGTON-RYDER, No. 22.

(Loading at half-cock only.)

Six motions, viz: Half-cocked, opened, loaded, closed, full-cocked, and fired.

Opened.—By bringing the hammer to the half-cock, the locking-brace sear, which is pivoted to its lower front portion, is pressed upward by riding over the nose of the trigger. It engages with the under side of the locking-brace, and causes it to follow the motion of the hammer until the latter is arrested on the half-cock notch.

Closed.—As the breech-block is drawn backward and downward by the usual means it strikes the locking-brace sear from above and throws it out of its notch in the brace. The hammer then, impelled by the main-spring and riding on its half-cock notch as a fulcrum, moves forward, carrying with it the locking-brace, by means of the transverse-pin connecting them, and causing it to bear against the back of the breech-block. When the breech is closed by the ordinary means, the hammer passes under the block, until arrested by striking a shoulder formed on its under surface.

Locked.—The piece is thereby locked independently of the hammer, which may then be cocked in the usual way.

Fired.—By a center-lock of the usual pattern, having a combined main and sear spring.

Extraction and ejection.—By the means described in No. 20.

NOTE.—After firing the piece, the hammer cannot be directly brought to the full-cock, for the revolution of the hammer-pin about the locking-brace pin in opening, brings the bearing of the hammer so low, that further motion is prevented, by the back of the comb of the hammer coming in contact with the top of the receiver.

REMINGTON-RYDER, No. 67.

(Loading at half-cock only.)

Six motions, viz: Cocked; opened; loaded; closed; full-cocked; fired.

Opened.—By bringing the hammer to the half-cock, the locking-brace-sear, which is pivoted on the lower portion of the hammer and pressed upward in passing over the nose of the trigger, engages against the back of the locking-brace below its center of motion. This causes its upper portion to follow the backward movement of the hammer, until the sear-fly, which is independent of the trigger and operated by the lower leaf of the mainspring, catches in its notch in the hammer, and keeps the hammer and brace together in place against the pressure of the mainspring.

Closed.—By then swinging back the breech-block into the space left by the withdrawal of the locking-brace, it trips the locking-brace-sear out of its notch, and when the breech is closed by the usual means, allows the locking-brace and hammer to swing forward together on the locking-brace pin, until the former strikes a notch prepared for it under the breech-block. The hammer meanwhile moving bodily on the same center as the brace, and by the longitudinal motion thus obtained preserving its contact with the sear-fly, is kept by it from following up the movement of the block. The change so caused in the position of the sear-fly changes the direction of the pressure of the lower leaf of the mainspring on its rearmost cam-shaped surface, so that when the hammer is brought to the full-cock, this pressure tends to throw the fly out of the notch in the hammer, instead of into it as before.

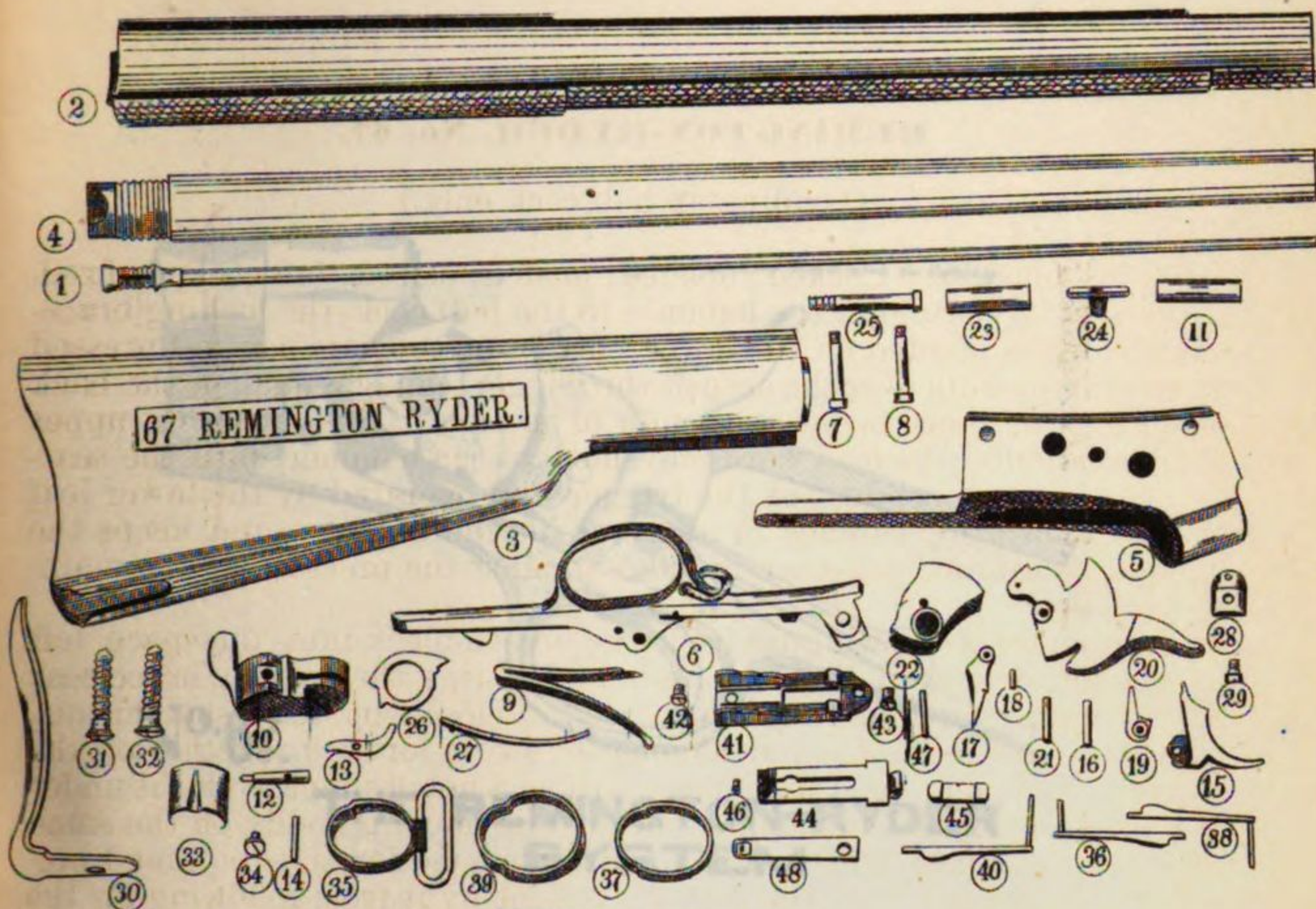
Locked.—By the position of the locking-brace independently of the hammer, which, when the breech has been closed, may be cocked in the usual way.

Fired.—By a center-lock of the usual pattern, the mainspring of which is double and has its lower leaf split near the end, so as to act upon both the trigger and the sear-fly.

Extraction and ejection.—By a mechanism essentially like that shown in No. 43, the ejection being helped by a flat spring playing on a cam-shaped shoulder on the rim of the extractor.

NOTE.—A shoulder is formed on the upper surface of the sear-fly, against which the end of the mainspring bears when the hammer and block are removed from the frame. A supplementary notch is formed in the lower surface of the locking-brace sear, which engages with the nose of the trigger, should the hammer be lowered to the half-cock after loading.

After firing, the hammer cannot be brought directly to the full-cock for the reason given in No. 22.



28 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

ELEVEN principal metallic parts not otherwise mentioned:

- 10 Breech Block,
- 12 Firing Pin,
- 13 Firing Pin Retractor,
- 5 Frame,
- 6 Guard,
- 15 Trigger,
- 17 Locking Brace Sear,

- 19 Sear Fly,
- 20 Hammer,
- 22 Locking Brace,
- 26 Extractor.

FOUR Screws:

- 7 Guard Screw,
- 8 Guard Screw,
- 20 Recoil Stud Screw,
- 25 Tang Screw.

SIX Pins:

- 11 Breech Block Pin,
- 14 Firing Pin Retractor Pin,

- 16 Trigger Pin,
- 18 Locking Brace Sear Pin,
- 21 Hammer Pin,
- 23 Locking Brace Pin.

Two Springs:

- 9 Main Spring,
- 27 Ejector Spring.

THREE other minor parts:

- 24 Button,
- 28 Recoil Stud,
- 28 Recoil Stud Dowel Pin.

26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 30 Butt Plate,
- 31 Butt Plate Screw,
- 32 Butt Plate Screw,
- 33 Tip,
- 34 Tip Screw,
- 35 Upper Band, Swivel & Pin,

- 36 Upper Band Spring,
- 37 Middle Band,
- 38 Middle Band Spring,
- 39 Lower Band,
- 40 Lower Band Spring,
- 41 Rear Sight Base,
- 42 Rear Sight Base Screw,
- 43 Rear Sight Base Screw,

- 44 Rear Sight Leaf,
- 45 Rear Sight Leaf Slide,
- 46 Rear Sight Leaf Screw,
- 47 Rear Sight Joint Pin,
- 48 Rear Sight Spring,
- 6 Guard Swivel and Pin.

REMINGTON-RYDER, No. 67.

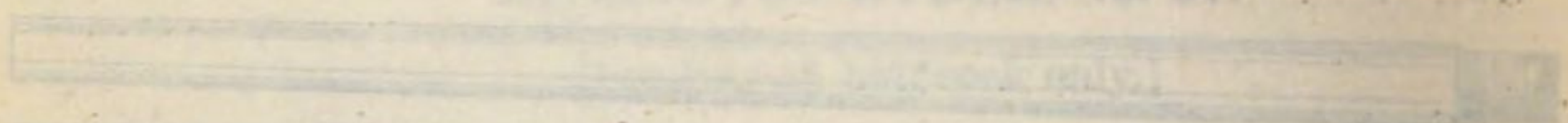


TABLE OF PARTS REFERRED TO IN THE SPECIFICATION

1. The base	20. The screw	39. The screw
2. The screw	21. The screw	40. The screw
3. The screw	22. The screw	41. The screw
4. The screw	23. The screw	42. The screw
5. The screw	24. The screw	43. The screw
6. The screw	25. The screw	44. The screw
7. The screw	26. The screw	45. The screw
8. The screw	27. The screw	46. The screw
9. The screw	28. The screw	47. The screw
10. The screw	29. The screw	48. The screw
11. The screw	30. The screw	49. The screw
12. The screw	31. The screw	50. The screw
13. The screw	32. The screw	51. The screw
14. The screw	33. The screw	52. The screw
15. The screw	34. The screw	53. The screw
16. The screw	35. The screw	54. The screw
17. The screw	36. The screw	55. The screw
18. The screw	37. The screw	56. The screw
19. The screw	38. The screw	57. The screw

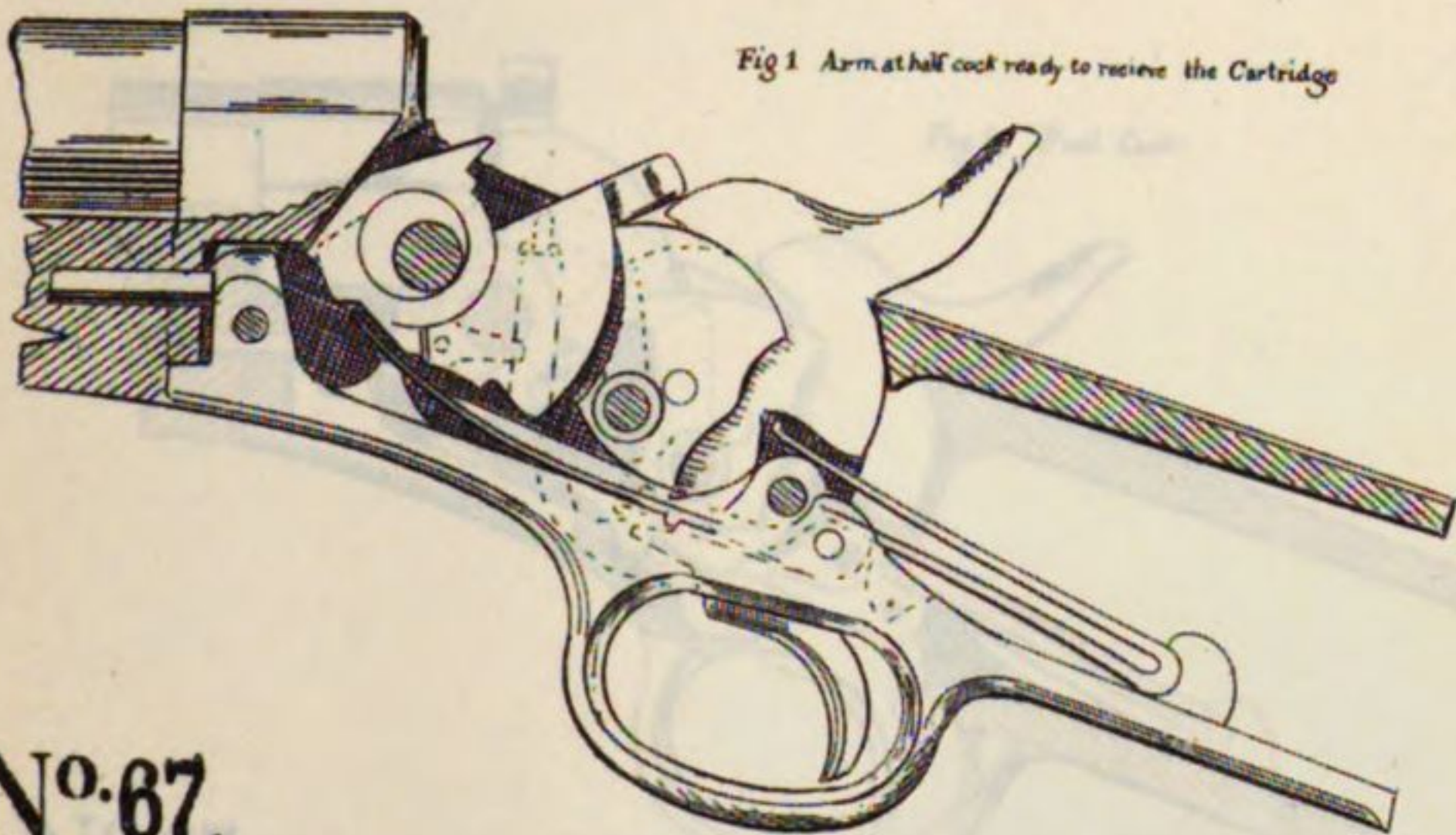


Fig 1 Arm at half cock ready to receive the Cartridge

N^o. 67.

THE REMINGTON-RYDER SYSTEM

LOADING AT HALF COCK ONLY

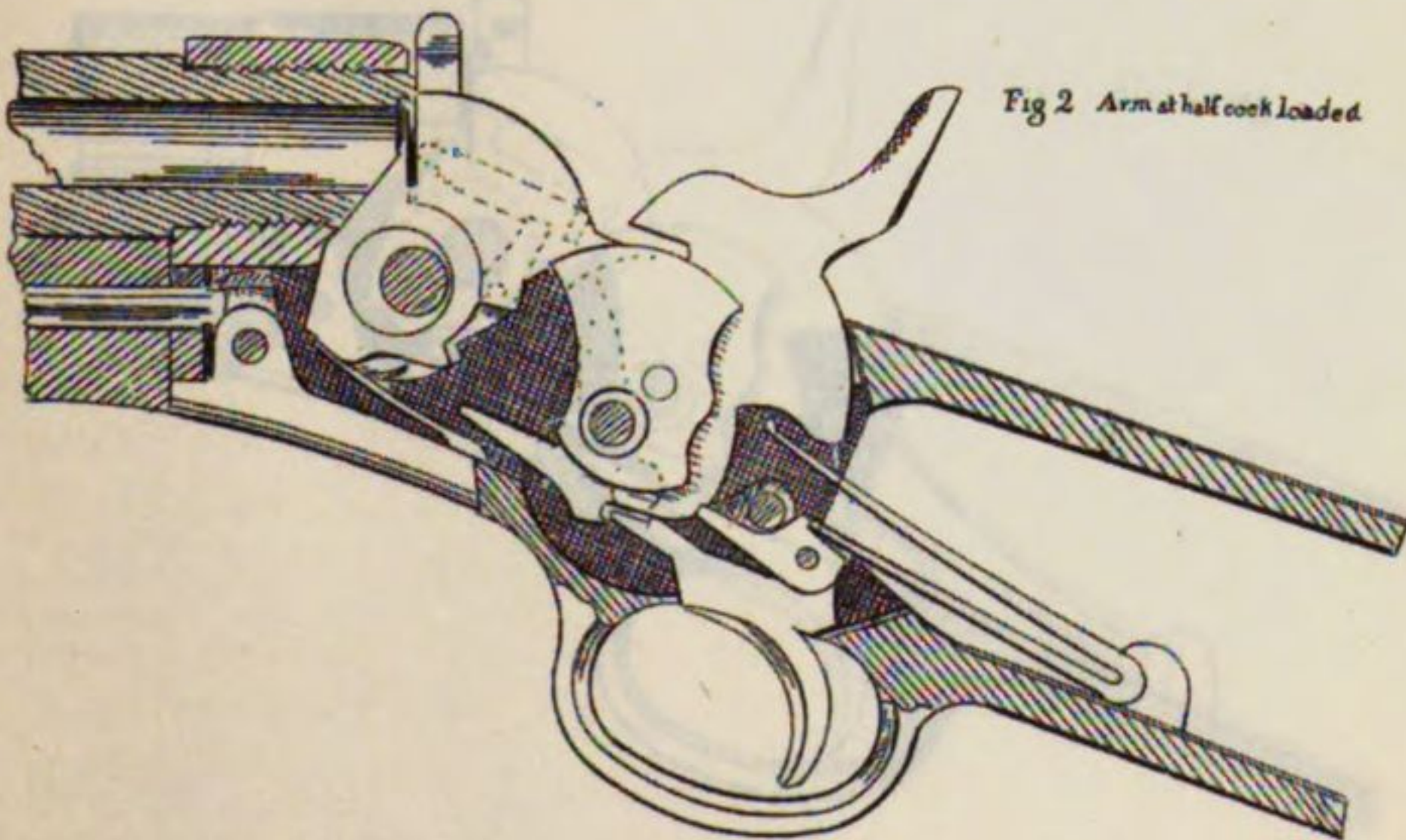


Fig 2 Arm at half cock loaded



THE REMINGTON-UNION SYSTEM

LOADING AT HALF COCK ONLY



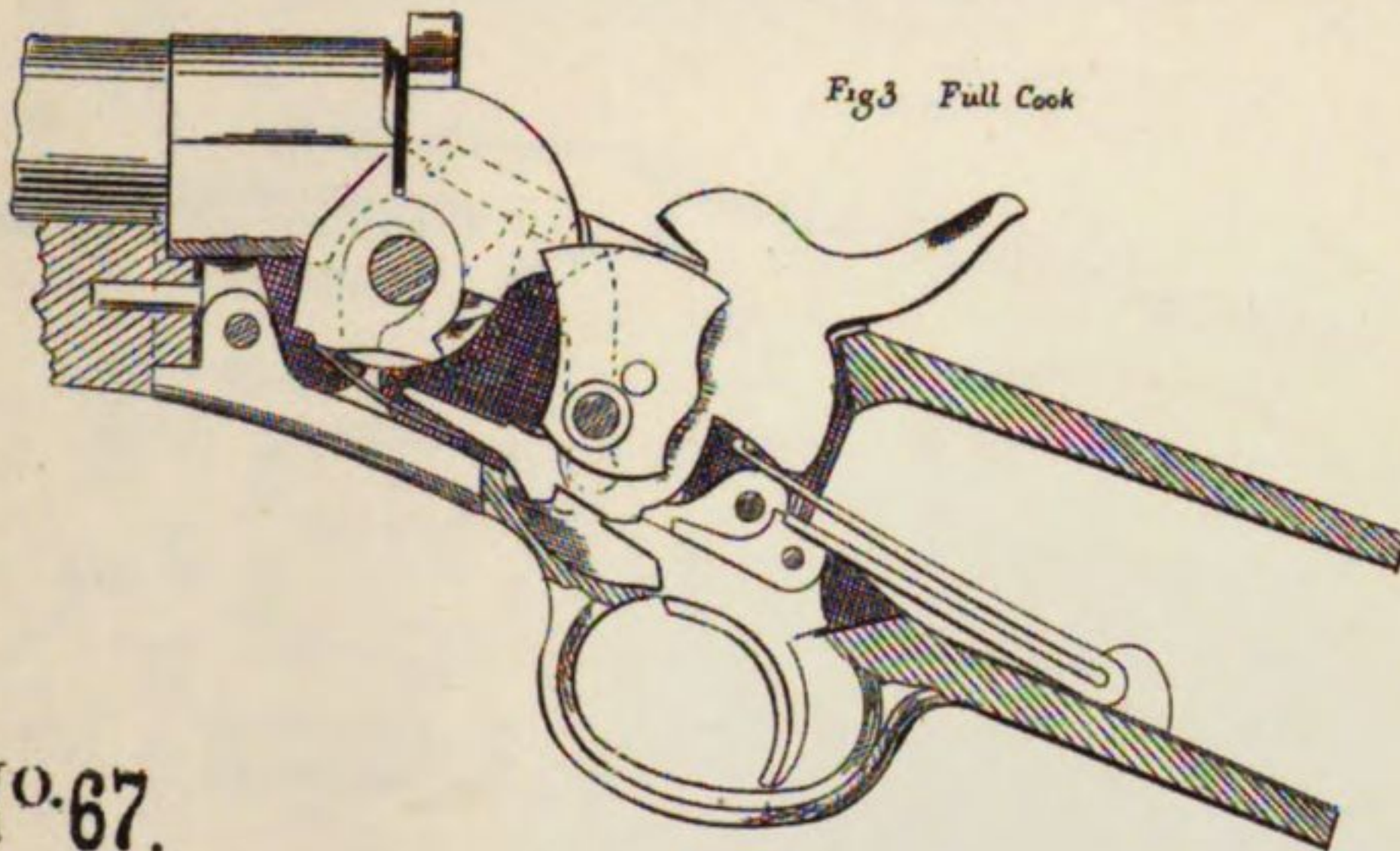


Fig 3 Full Cock

No. 67.

THE REMINGTON-RYDER SYSTEM

LOADING AT HALF COCK ONLY

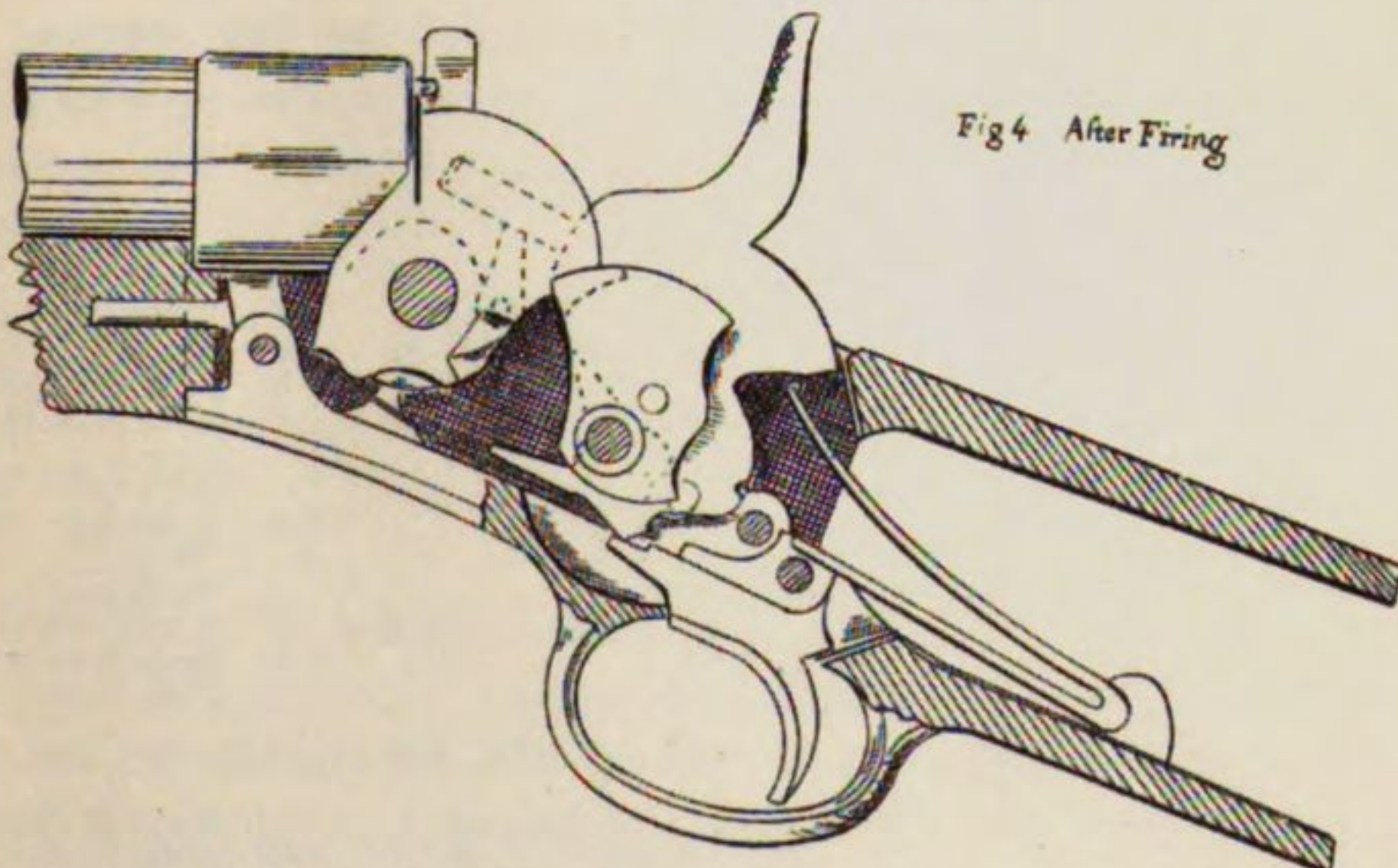
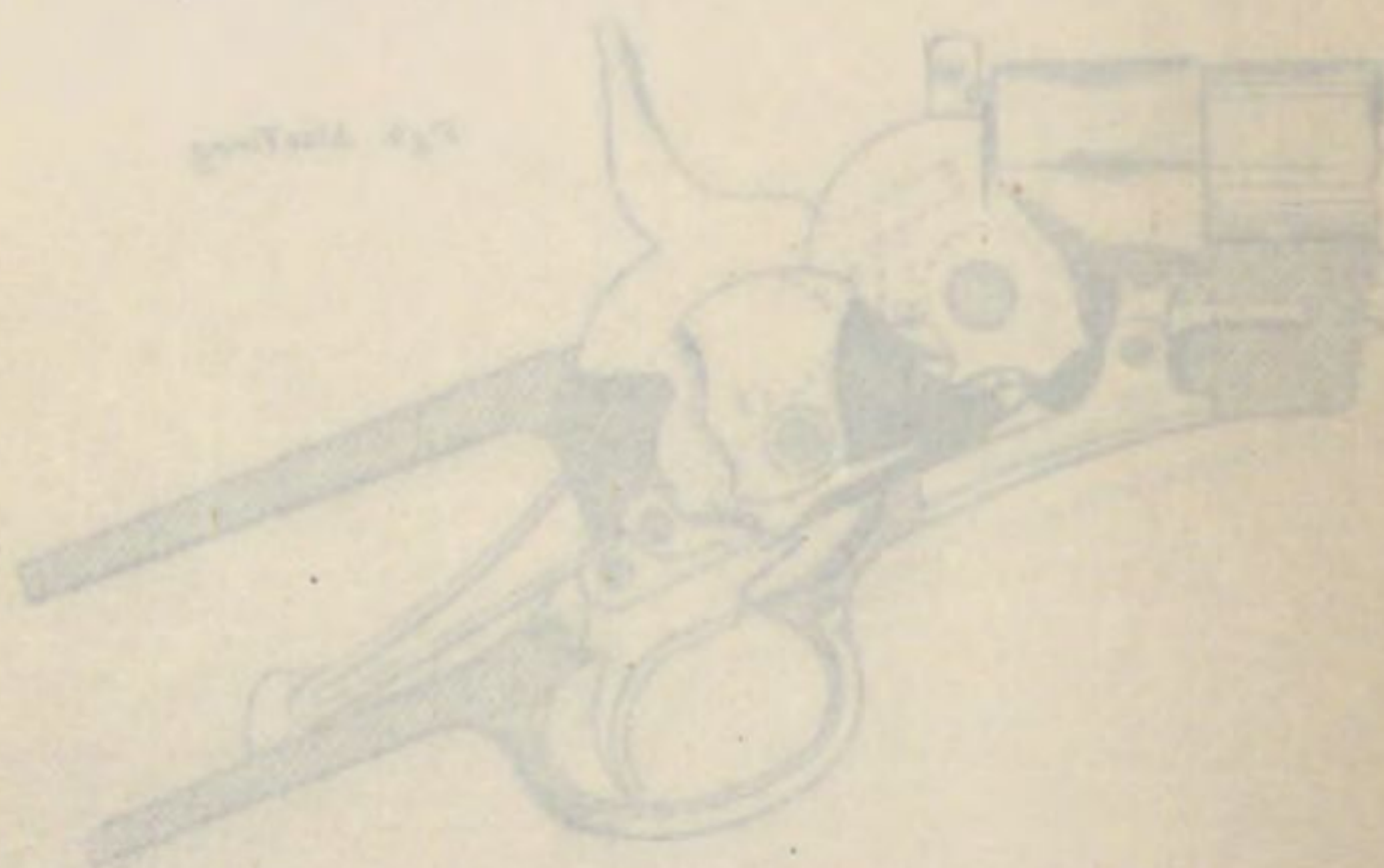


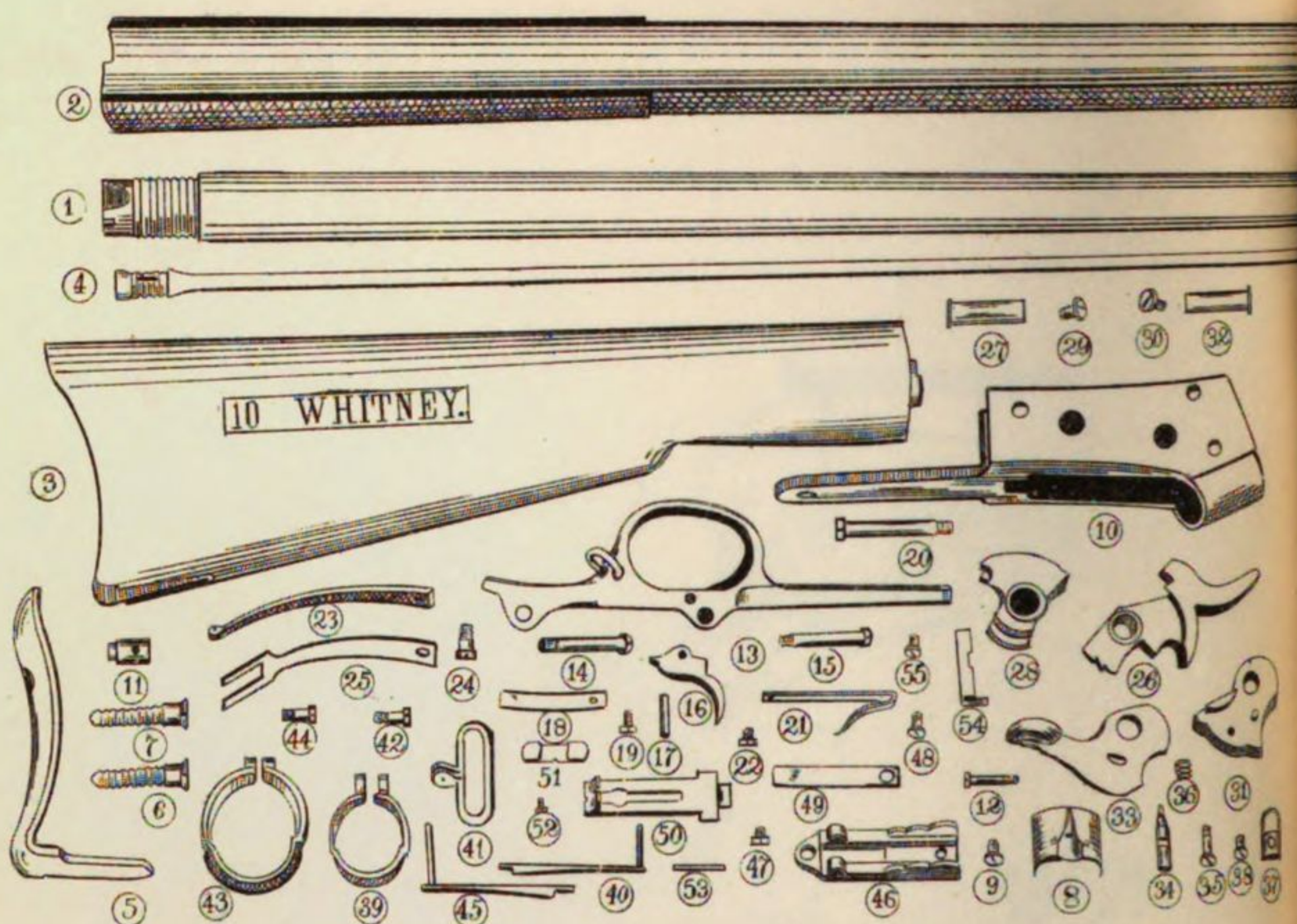
Fig 4 After Firing



THE REMINGTON-UNION SYSTEM

LOADING AT HALF COCK ONLY





38 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

NINE principal metallic parts not otherwise mentioned:

- 10 Frame,
- 26 Hammer,
- 28 Locking Brace,
- 31 Breech Block,
- 33 Cam Lever,
- 34 Firing Pin,
- 13 Guard,
- 16 Trigger,
- 54 Extractor.

TWELVE Screws:

- 29 Hammer Pin Screw,

- 30 Breech Block Pin Screw,
- 35 Firing Pin Screw,
- 12 Main Spring Stop Screw,
- 24 Main Spring Screw,
- 14 Guard Screw,
- 15 Guard Screw,
- 19 Trigger Spring Screw,
- 22 Friction Spring Screw,
- 55 Extractor Screw,
- 38 Recoil Stud Screw,
- 20 Tang Screw.

FIVE Pins:

- 27 Hammer Pin,
- 28 Locking Brace Friction Roll Pin,
- 32 Breech Block Pin,

- 23 Main Spring Friction Roll Pin,
- 17 Trigger Pin.

FIVE Springs:

- 36 Firing Pin Spring,
- 23 Main Spring,
- 25 Locking Brace Spring,
- 18 Trigger Spring,
- 21 Friction Spring.

FIVE other minor parts:

- 28 Locking Brace Friction Roll,
- 23 Main Spring Friction Roll,
- 37 Recoil Stud,
- 37 Recoil Stud Dowel Pin,
- 31 Cam Lever Stop Pin.

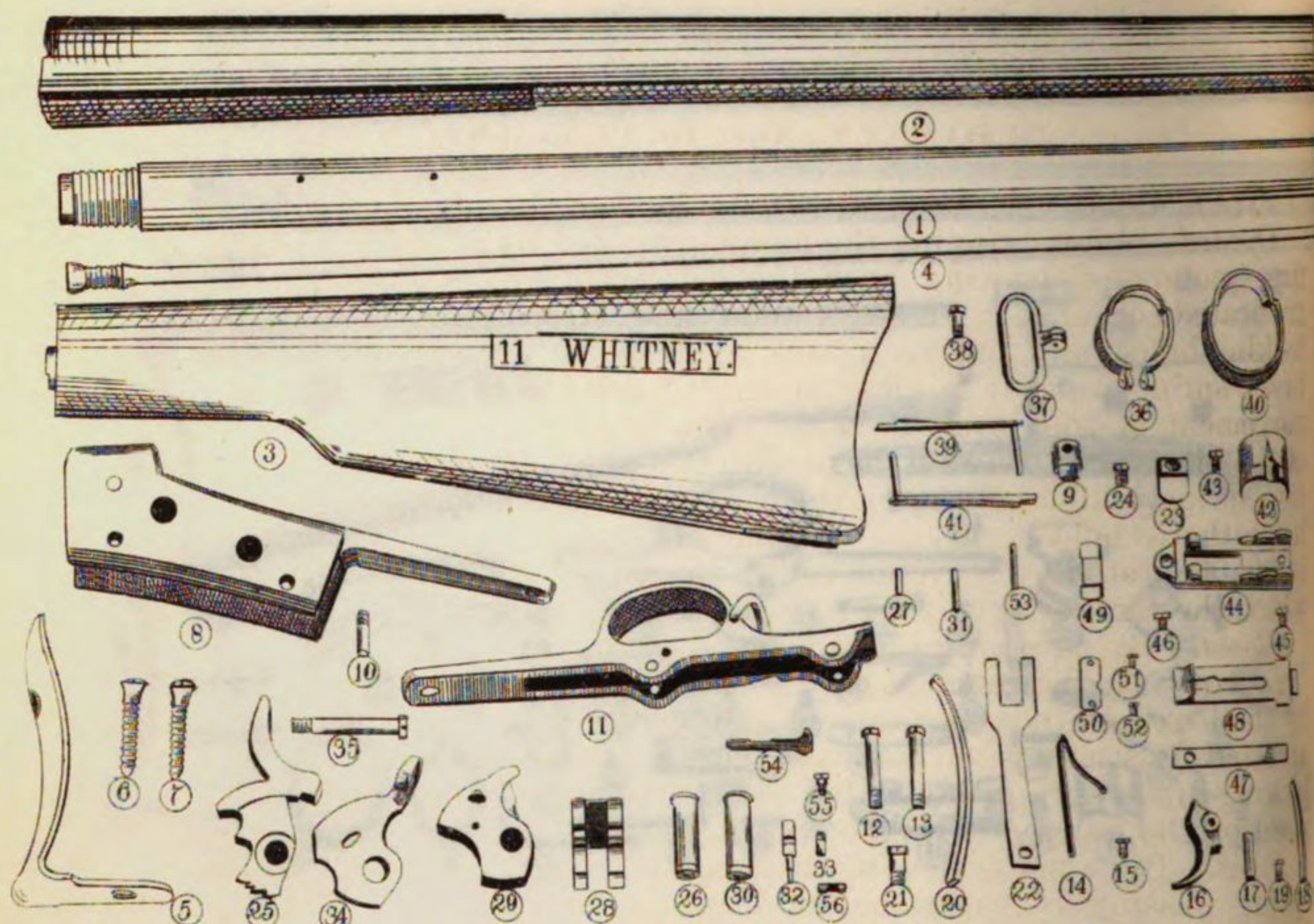
26 PARTS NOT PECULIAR TO THE SYSTEM. OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 8 Tip,
- 9 Tip Screw,
- 39 Upper Band,

- 40 Upper Band Spring,
- 41 Upper Band Swivel,
- 42 Upper Band Swivel Scr.,
- 43 Lower Band,
- 44 Lower Band Screw,
- 45 Lower Band Spring,
- 46 Rear Sight Base,
- 47 Rear Sight Base Screw,

- 48 Rear Sight Base Screw,
- 49 Rear Sight Spring,
- 50 Rear Sight Leaf,
- 51 Rear Sight Leaf Slide,
- 52 Rear Sight Leaf Screw,
- 53 Rear Sight Joint Pin,
- 13 Guard Swivel and Pin,
- 11 Ramrod Stop.

WHITNEY, No. 10.



35 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

NINE principal metallic parts not otherwise mentioned:

- 8 Frame,
- 25 Hammer,
- 28 Locking Brace,
- 29 Breech Block,
- 32 Firing Pin,
- 34 Cam Lever,
- 54 Extractor,
- 11 Guard,
- 16 Trigger.

TWELVE Screws:

- 27 Hammer Pin Screw,
- 31 Breech Block Pin Screw,
- 33 Firing Pin Retractor Scr.,
- 55 Extractor Stop Screw,
- 10 Main Spring Stop Screw,
- 21 Main Spring Screw,
- 12 Guard Screw,
- 13 Guard Screw,
- 15 Friction Spring Screw,
- 19 Trigger Spring Screw,
- 24 Recoil Stud Screw,
- 35 Tang Screw.

FIVE Pins:

- 26 Hammer Pin,

- 30 Breech Block Pin,
- 56 Cam Lever Stop Pin,
- 20 Main Spring Friction Roll Pin,
- 17 Trigger Pin.

FOUR Springs.

- 22 Locking Brace Spring,
- 20 Main Spring,
- 14 Friction Spring,
- 18 Trigger Spring.

THREE other minor parts:

- 20 Main Spring Friction Roll,
- 23 Recoil Stud,
- 23 Recoil Stud Dowel Pin.

26 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 36 Upper Band,
- 37 Upper Band Swivel,
- 38 Upper Band Screw,
- 39 Upper Band Spring,

- 40 Lower Band,
- 41 Lower Band Spring,
- 42 Tip,
- 43 Tip Screw,
- 44 Rear Sight Base,
- 45 Rear Sight Base Screw,
- 46 Rear Sight Base Screw,
- 47 Rear Sight Spring,
- 48 Rear Sight Leaf,

- 49 Rear Sight Leaf Slide,
- 50 Rear Sight Leaf Slide Cap,
- 51 Rear Sight Leaf Slide Cap Screw,
- 52 Rear Sight Leaf Slide Cap Screw,
- 53 Rear Sight Joint Pin,
- 9 Ramrod Stop,
- 11 Guard Swivel.

WHITNEY, No. 11.

WHITNEY, Nos. 10, 11, and 77.

Five motions, viz: Cocked, opened, loaded, closed, and fired.

Opened.—After bringing the hammer to the half- or full-cock, by the first motion of drawing back the cam-lever by its thumb-piece, the truncated corner in rear bears upon the corresponding shoulder of the locking-brace, and pushes it back against the pressure of the locking-brace spring until it is clear of the breech-block. By continuing the movement of the lever, it bears upon a projecting stud on the side of the block, and draws it back with it against the pressure of the friction-spring, which, acting on the cam-shaped lower surface of the block, has hitherto held it closed. In some of these arms the motion of opening is facilitated by a friction-roll in the side of the breech-block against which the cam-lever may bear. (See page 322.)

Closed.—By reversing the movement of the lever.

Locked.—By the brace at the instant of closing, being thrown forward by the locking-brace spring, and falling under the breech-block until arrested by striking the truncated corner of the cam-lever. In case the locking-brace spring should fail to act, the locking-brace is carried forward by the hammer when the piece is fired.

Fired.—By a center-lock of the usual pattern, the point of the main-spring passing between the forks of the locking-brace spring. The hammer has, besides the full-cock and half-cock notches on which it can be loaded, a third notch on which it can be carried loaded without fear of accidental opening or discharge; the face of the hammer being off the firing-pin, and the breech being secured from opening by unintentional pressure on the thumb-piece, by the resistance afforded by the hammer to the withdrawal of the brace.

Extraction.—By a disk-like extractor swinging on the same center as the block, and provided with two diametrical arms, the upper of which is in contact with the front of the rim of the cartridge, and the lower of which is struck by a shoulder on the block in opening.

Ejection.—By accelerating the opening of the breech-block by the pressure of the friction-spring on its lower cam-shaped surface. In the act of withdrawing the lever, it engages with a pin projecting from the side of the firing-pin, and retracts it to an extent determined by the elongation of the hole in the side of the breech-block through which it passes.

Nos. 10 and 11 differ from No. 77 in having an extractor sliding under the barrel and moved by a shoulder on the breech-block. No. 10, besides, has no firing-pin retractor.

For convenience in assembling No. 77, a spring-sear is pivoted in the side of the guard-strap, and when the locking-brace, by external means is pressed completely back, it engages with a notch in its under surface, and keeps it from bearing on the breech-block while this last is being removed. After re-assembling the piece, this spring-sear may be detached by opening the breech-block to its full extent.

WHITNEY SYSTEM, IMPROVED.

This is on the same general plan as the Whitney systems, Nos. 11 and 77.

Locked.—To secure the locking-brace from being forced back by the strain of an excessive charge, as it occurred with No. 77 in the experiments before the Board, a locking-lever is pivoted below the breech-block, its rear end being pressed upward by a spring lying beneath it, so that it may abut against the lower and front portion of the locking-brace when the piece is closed, and so lock it at the moment of the discharge.

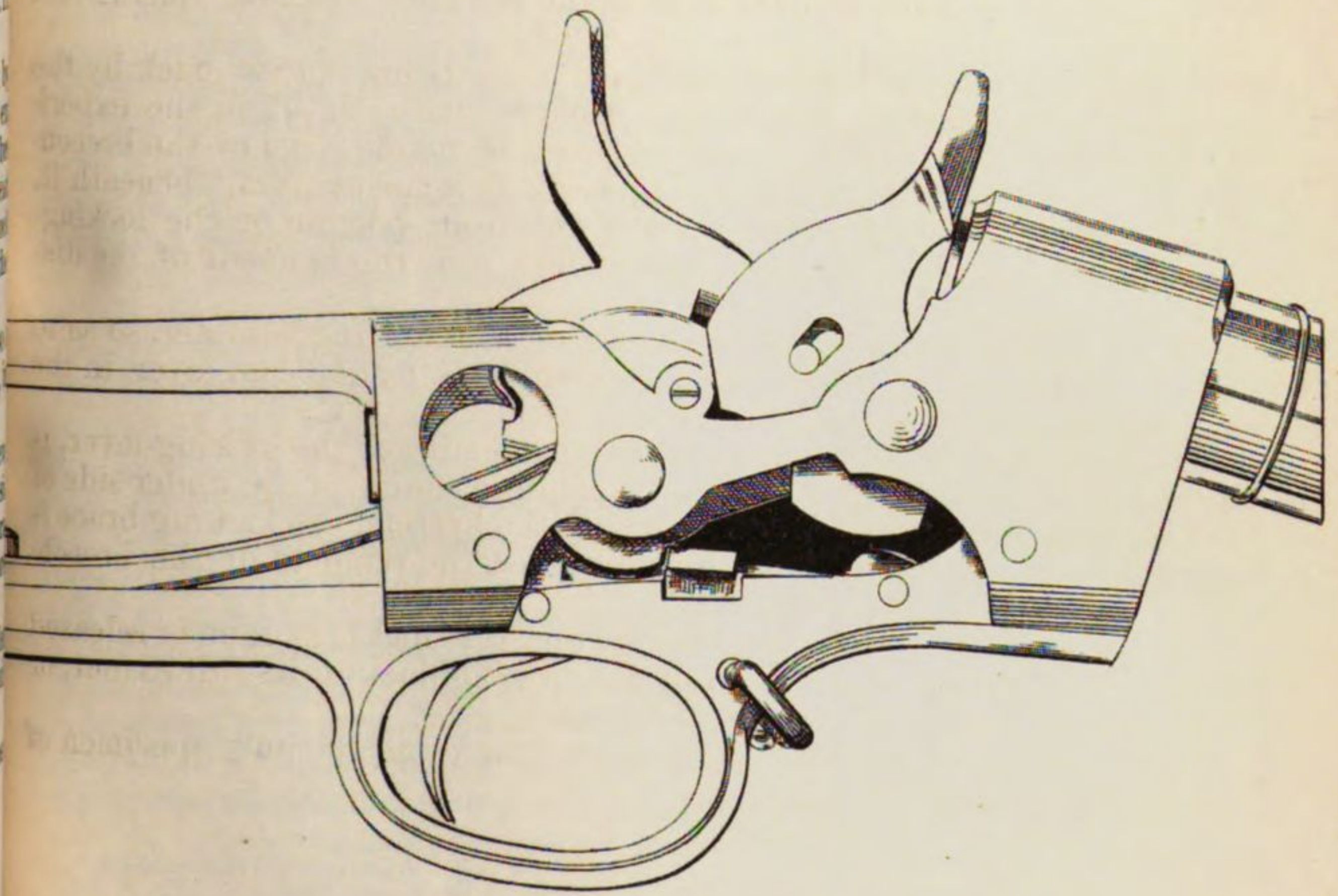
This locking-lever may be depressed by cocking the hammer, so as to admit of the locking-brace being thrown back by the cam-lever, in the regular motion of opening the piece.

Dismounting.—A slight hook at the extremity of the locking-lever, is intended to be engaged with a corresponding notch in the under side of the locking-brace, when in dismounting the system, the locking-brace is pushed back by hand, so as not to hinder the removal of the breech-block by bearing against it.

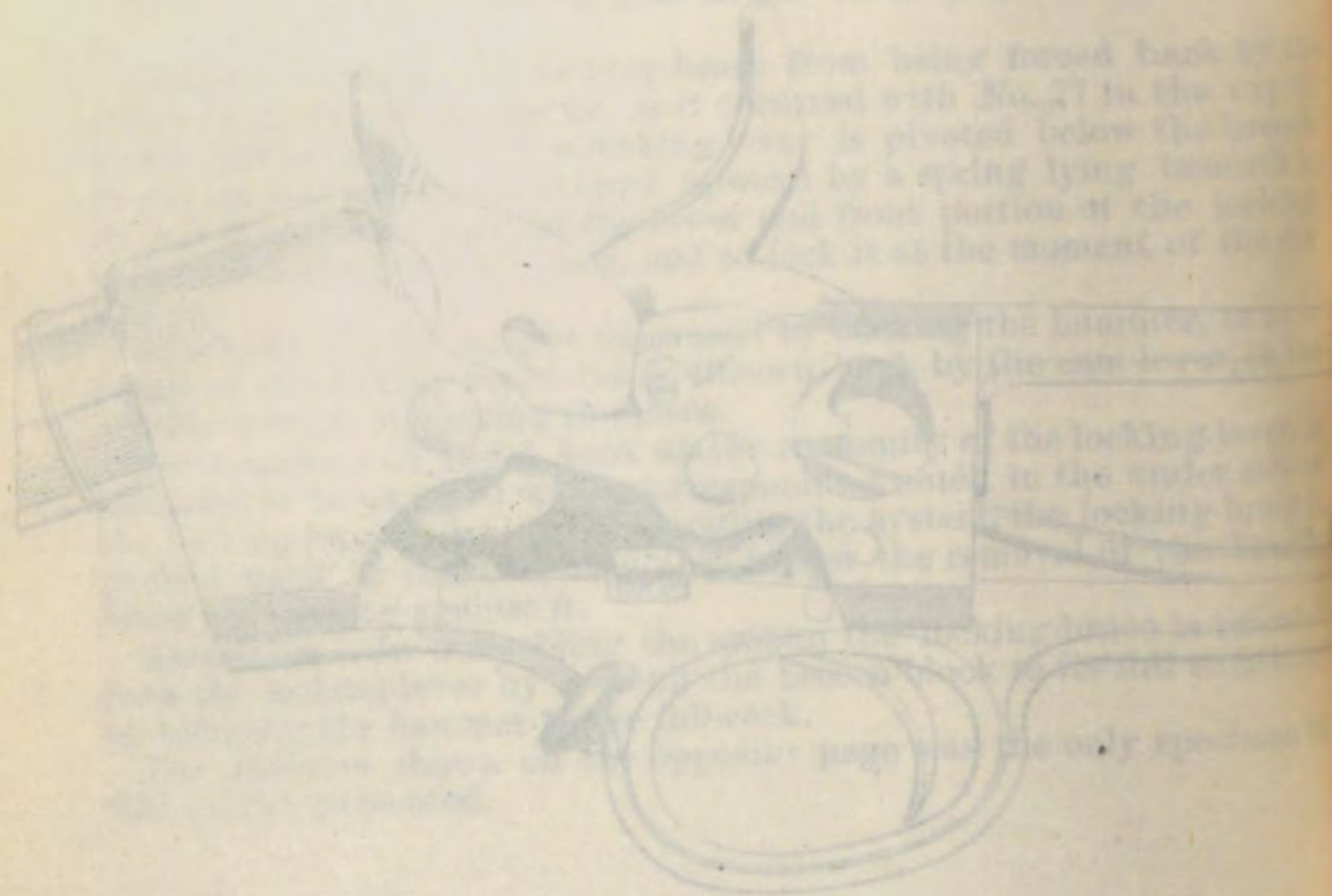
Assembling.—In assembling the system the locking-brace is released from the locking-lever by opening the breech-block to its full extent, or by bringing the hammer to the full-cock.

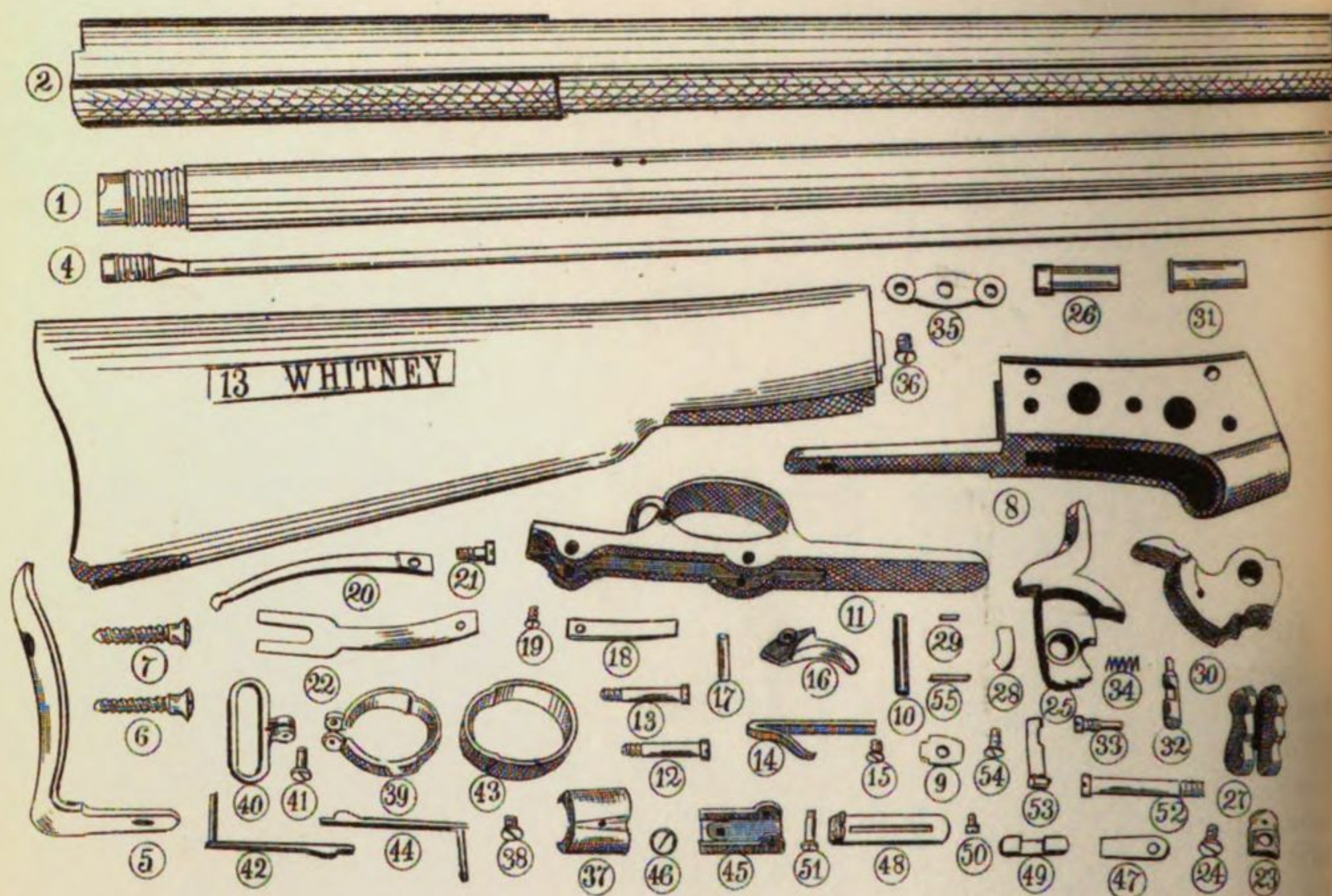
The skeleton shown on the opposite page was the only specimen of this system presented.

WHITNEY SYSTEM, IMPROVED.



WELTNEY SYSTEM, IMPROVED.





37 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

NINE principal metallic parts
not otherwise mentioned:

- 8 Frame,
- 25 Hammer,
- 30 Breech Block,
- 27 Locking Brace,
- 28 Locking Brace Retractor,
- 32 Firing Pin,
- 11 Guard,
- 16 Trigger,
- 53 Extractor.

TEN Screws:

- 33 Firing Pin Screw,

- 36 Button Screw,
- 12 Guard Screw,
- 13 Guard Screw,
- 15 Friction Spring Screw,
- 19 Trigger Spring Screw,
- 21 Main Spring Screw,
- 54 Extractor Screw,
- 24 Recoil Stud Screw,
- 52 Tang Screw.

SIX Pins:

- 26 Hammer Pin,
- 31 Breech Block Pin,
- 29 Locking Brace Retractor Pin,
- 17 Trigger Pin,
- 20 Main Spring Friction Roll Pin,

- 10 Main Spring Stop Pin,

SIX Springs:

- 34 Firing Pin Spring,
- 14 Friction Spring,
- 18 Trigger Spring,
- 20 Main Spring,
- 22 Locking Brace Spring,
- 55 Locking Brace Retractor Spring.

FOUR other minor parts:

- 35 Button,
- 20 Main Spring Friction Roll,
- 23 Recoil Stud,
- 23 Recoil Stud Dowel Pin.

24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 37 Tip,
- 38 Tip Screw,
- 39 Upper Band,

- 40 Upper Band Swivel,
- 41 Upper Band Swivel Scr.,
- 42 Upper Band Spring,
- 43 Lower Band,
- 44 Lower Band Spring,
- 45 Rear Sight Base,
- 46 Rear Sight Base Screw,
- 47 Rear Sight Spring,

- 48 Rear Sight Leaf,
- 49 Rear Sight Leaf Slide,
- 50 Rear Sight Leaf Slide Screw,
- 51 Rear Sight Joint Screw,
- 11 Guard Swivel and Pin,
- 9 Ramrod Stop.

WHITNEY, No. 13.

WHITNEY, No. 13.

Five motions, viz: Cocked; opened; loaded; closed; fired.

Opened.—By bringing the hammer to the full-cock, a spring-hook retractor in front of it, catches and withdraws the locking-brace, which until this has been done, has been supporting the rear of the breech-block. The breech-block may then be drawn back by its projecting thumb-piece. As its descent is completed, a stud shown on its back strikes the retractor and detaches it from the locking-brace, which, under the influence of its own spring, is thrown forward and pressed against the back of the bolt until it is closed.

Closed.—By reversing the movement of the breech-block. The piece is locked against any accidental discharge in the act of closing, by the front end of the brace passing under the rear of the block, just as the latter is coming into place, until it is stopped by striking a shoulder formed on the lower surface of the block. It is still further secured, in case of the failure of the locking-brace spring to work, by the more complete entrance of the locking-brace under the block, from its being carried forward with the hammer when the piece is fired.

Fired.—By a center-lock of the usual pattern.

Extraction.—By a sliding extractor beneath the barrel, struck by a shoulder on the breech-block in the act of opening.

Ejection.—By accelerating the opening of the breech-block by the pressure of the friction-spring on its lower cam-shaped surface.

DEXTER, No. 38.

Five motions, viz: Cocked; opened; loaded; closed; fired.

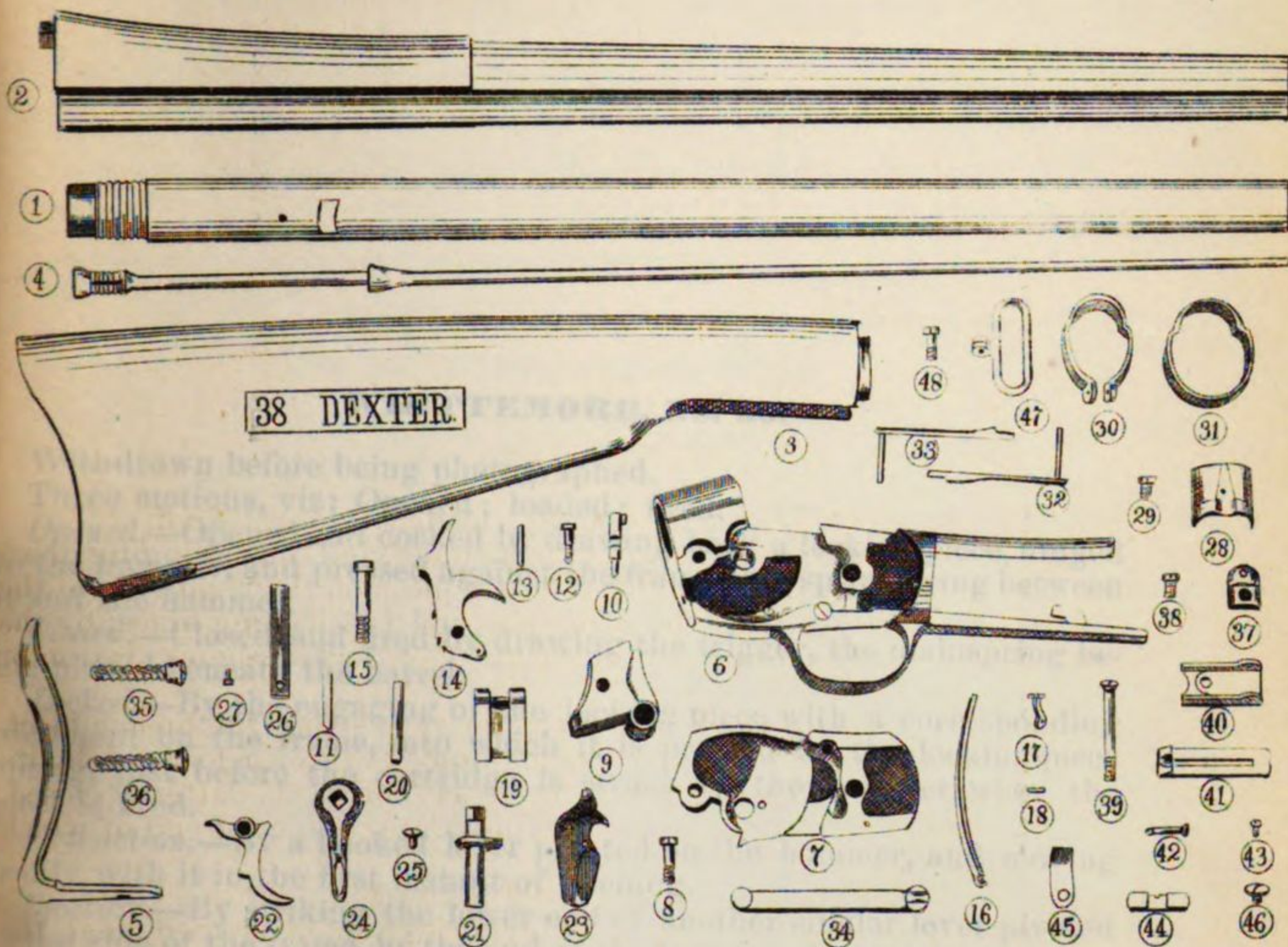
Opened.—By half- or full-cocking the hammer, and then swinging down the breech-block by depressing the thumb-piece on the right side of the frame. This pushes back the firing-pin and the locking-brace, by the cam acting on the firing-pin retractor and locking-brace retractor respectively.

Closed.—By raising the thumb-piece, so as to swing the breech-block up into place. In so doing, the locking-brace is thrown forward by its spring, into place under the breech-block, as soon as the latter is closed.

Locked.—By the position of the locking-brace, the lower end of which abuts upon the guard.

Fired.—By a center-lock of the usual pattern.

Extraction and ejection.—By a revolving extractor, pivoted near the breech-block pin, and struck by the block in its descent. In opening the block the locking-brace is forced against the trigger, and is held there by the block; the hammer therefore, cannot be made to fall while the piece is opened.



28 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Tip Stock,
- 3 Butt Stock.

THIRTEEN principal metallic parts not otherwise mentioned:

- 6 Frame,
- 7 Side Plate,
- 9 Breech Block,
- 10 Firing Pin,
- 13 Firing Pin Retractor,
- 14 Hammer,
- 19 Locking Brace,

- 11 Locking Brace Retractor,
- 21 Cam and Breech Block Pin,
- 22 Trigger,
- 23 Extractor,
- 24 Thumb Piece,
- 17 Main Spring Swivel.

SEVEN Screws:

- 38 Recoil Stud Screw,
- 8 Side Plate Screw,
- 12 Firing Pin Screw,
- 15 Hammer Screw,
- 25 Thumb Piece Screw,

- 27 Trigger & Locking Brace Spring Screw,
- 39 Tang Screw.

Two Pins:

- 18 Main Spring Swivel Pin,
- 20 Locking Brace Pin.

Two Springs:

- 16 Main Spring,
- 26 Trigger Spring and Locking Brace Spring.

Two other minor parts:

- 37 Recoil Stud,
- 37 Recoil Stud Dowel Pin.

22 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 5 Butt Plate,
- 35 Butt Plate Screw,
- 36 Butt Plate Screw,
- 28 Tip,
- 29 Tip Screw,

- 30 Upper Band,
- 32 Upper Band Spring,
- 31 Lower Band,
- 33 Lower Band Spring,
- 40 Rear Sight Base,
- 41 Rear Sight Leaf,
- 42 Rear Sight Joint Screw,

- 43 Rear Sight Leaf Screw,
- 44 Rear Sight Leaf Slide,
- 45 Rear Sight Spring,
- 46 Rear Sight Base Screw,
- 47 Upper Band Swivel,
- 48 Upper Band Swivel Scr.,
- 34 Ramrod Stop.

DEXTER, No. 38.

32 DEXTER

32 OF THE

1	Tip of shoe	11	Location of the heel	21	Tip of shoe
2	Ball of shoe	12	Location of the ball	22	Ball of shoe
3	Heel of shoe	13	Location of the heel	23	Heel of shoe
4	Tip of shoe	14	Location of the ball	24	Tip of shoe
5	Ball of shoe	15	Location of the heel	25	Ball of shoe
6	Heel of shoe	16	Location of the ball	26	Heel of shoe
7	Tip of shoe	17	Location of the heel	27	Tip of shoe
8	Ball of shoe	18	Location of the ball	28	Ball of shoe
9	Heel of shoe	19	Location of the heel	29	Heel of shoe
10	Tip of shoe	20	Location of the ball	30	Tip of shoe
11	Ball of shoe	21	Location of the heel	31	Ball of shoe
12	Heel of shoe	22	Location of the ball	32	Heel of shoe
13	Tip of shoe	23	Location of the heel	33	Tip of shoe
14	Ball of shoe	24	Location of the ball	34	Ball of shoe
15	Heel of shoe	25	Location of the heel	35	Heel of shoe
16	Tip of shoe	26	Location of the ball	36	Tip of shoe
17	Ball of shoe	27	Location of the heel	37	Ball of shoe
18	Heel of shoe	28	Location of the ball	38	Heel of shoe
19	Tip of shoe	29	Location of the heel	39	Tip of shoe
20	Ball of shoe	30	Location of the ball	40	Ball of shoe
21	Heel of shoe	31	Location of the heel	41	Heel of shoe
22	Tip of shoe	32	Location of the ball	42	Tip of shoe
23	Ball of shoe	33	Location of the heel	43	Ball of shoe
24	Heel of shoe	34	Location of the ball	44	Heel of shoe
25	Tip of shoe	35	Location of the heel	45	Tip of shoe
26	Ball of shoe	36	Location of the ball	46	Ball of shoe
27	Heel of shoe	37	Location of the heel	47	Heel of shoe
28	Tip of shoe	38	Location of the ball	48	Tip of shoe
29	Ball of shoe	39	Location of the heel	49	Ball of shoe
30	Heel of shoe	40	Location of the ball	50	Heel of shoe
31	Tip of shoe	41	Location of the heel	51	Tip of shoe
32	Ball of shoe	42	Location of the ball	52	Ball of shoe
33	Heel of shoe	43	Location of the heel	53	Heel of shoe
34	Tip of shoe	44	Location of the ball	54	Tip of shoe
35	Ball of shoe	45	Location of the heel	55	Ball of shoe
36	Heel of shoe	46	Location of the ball	56	Heel of shoe
37	Tip of shoe	47	Location of the heel	57	Tip of shoe
38	Ball of shoe	48	Location of the ball	58	Ball of shoe
39	Heel of shoe	49	Location of the heel	59	Heel of shoe
40	Tip of shoe	50	Location of the ball	60	Tip of shoe
41	Ball of shoe	51	Location of the heel	61	Ball of shoe
42	Heel of shoe	52	Location of the ball	62	Heel of shoe
43	Tip of shoe	53	Location of the heel	63	Tip of shoe
44	Ball of shoe	54	Location of the ball	64	Ball of shoe
45	Heel of shoe	55	Location of the heel	65	Heel of shoe
46	Tip of shoe	56	Location of the ball	66	Tip of shoe
47	Ball of shoe	57	Location of the heel	67	Ball of shoe
48	Heel of shoe	58	Location of the ball	68	Heel of shoe
49	Tip of shoe	59	Location of the heel	69	Tip of shoe
50	Ball of shoe	60	Location of the ball	70	Ball of shoe
51	Heel of shoe	61	Location of the heel	71	Heel of shoe
52	Tip of shoe	62	Location of the ball	72	Tip of shoe
53	Ball of shoe	63	Location of the heel	73	Ball of shoe
54	Heel of shoe	64	Location of the ball	74	Heel of shoe
55	Tip of shoe	65	Location of the heel	75	Tip of shoe
56	Ball of shoe	66	Location of the ball	76	Ball of shoe
57	Heel of shoe	67	Location of the heel	77	Heel of shoe
58	Tip of shoe	68	Location of the ball	78	Tip of shoe
59	Ball of shoe	69	Location of the heel	79	Ball of shoe
60	Heel of shoe	70	Location of the ball	80	Heel of shoe
61	Tip of shoe	71	Location of the heel	81	Tip of shoe
62	Ball of shoe	72	Location of the ball	82	Ball of shoe
63	Heel of shoe	73	Location of the heel	83	Heel of shoe
64	Tip of shoe	74	Location of the ball	84	Tip of shoe
65	Ball of shoe	75	Location of the heel	85	Ball of shoe
66	Heel of shoe	76	Location of the ball	86	Heel of shoe
67	Tip of shoe	77	Location of the heel	87	Tip of shoe
68	Ball of shoe	78	Location of the ball	88	Ball of shoe
69	Heel of shoe	79	Location of the heel	89	Heel of shoe
70	Tip of shoe	80	Location of the ball	90	Tip of shoe
71	Ball of shoe	81	Location of the heel	91	Ball of shoe
72	Heel of shoe	82	Location of the ball	92	Heel of shoe
73	Tip of shoe	83	Location of the heel	93	Tip of shoe
74	Ball of shoe	84	Location of the ball	94	Ball of shoe
75	Heel of shoe	85	Location of the heel	95	Heel of shoe
76	Tip of shoe	86	Location of the ball	96	Tip of shoe
77	Ball of shoe	87	Location of the heel	97	Ball of shoe
78	Heel of shoe	88	Location of the ball	98	Heel of shoe
79	Tip of shoe	89	Location of the heel	99	Tip of shoe
80	Ball of shoe	90	Location of the ball	100	Ball of shoe

DEXTER, No. 32

WHITTEMORE, No. 36.

Withdrawn before being photographed.

Three motions, viz: Opened; loaded; fired.

Opened.—Opened and cocked by drawing back a locking-piece, hinged to the hammer, and pressed against the frame by a spring lying between it and the hammer.

Closed.—Closed and fired by drawing the trigger, the mainspring being placed beneath the barrel.

Locked.—By the engaging of the locking-piece with a corresponding abutment on the frame, into which it is pressed by the locking-piece spring, just before the cartridge is struck by the hammer when the piece is fired.

Extraction.—By a hooked lever pivoted on the hammer, and moving bodily with it in the first instant of opening.

Ejection.—By striking the lower end of another similar lever pivoted to the side of the frame, by the end of the locking-piece, when the opening is nearly completed.

A flap hinged to the top of the barrel may be interposed between the head of the cartridge and the hammer, so that the piece may be carried safely when loaded; the upper portion of this flap is formed into a sight base.

MUIR-MONTSTORM, No. 60.

Four motions, viz : Opened ; loaded ; closed ; fired.

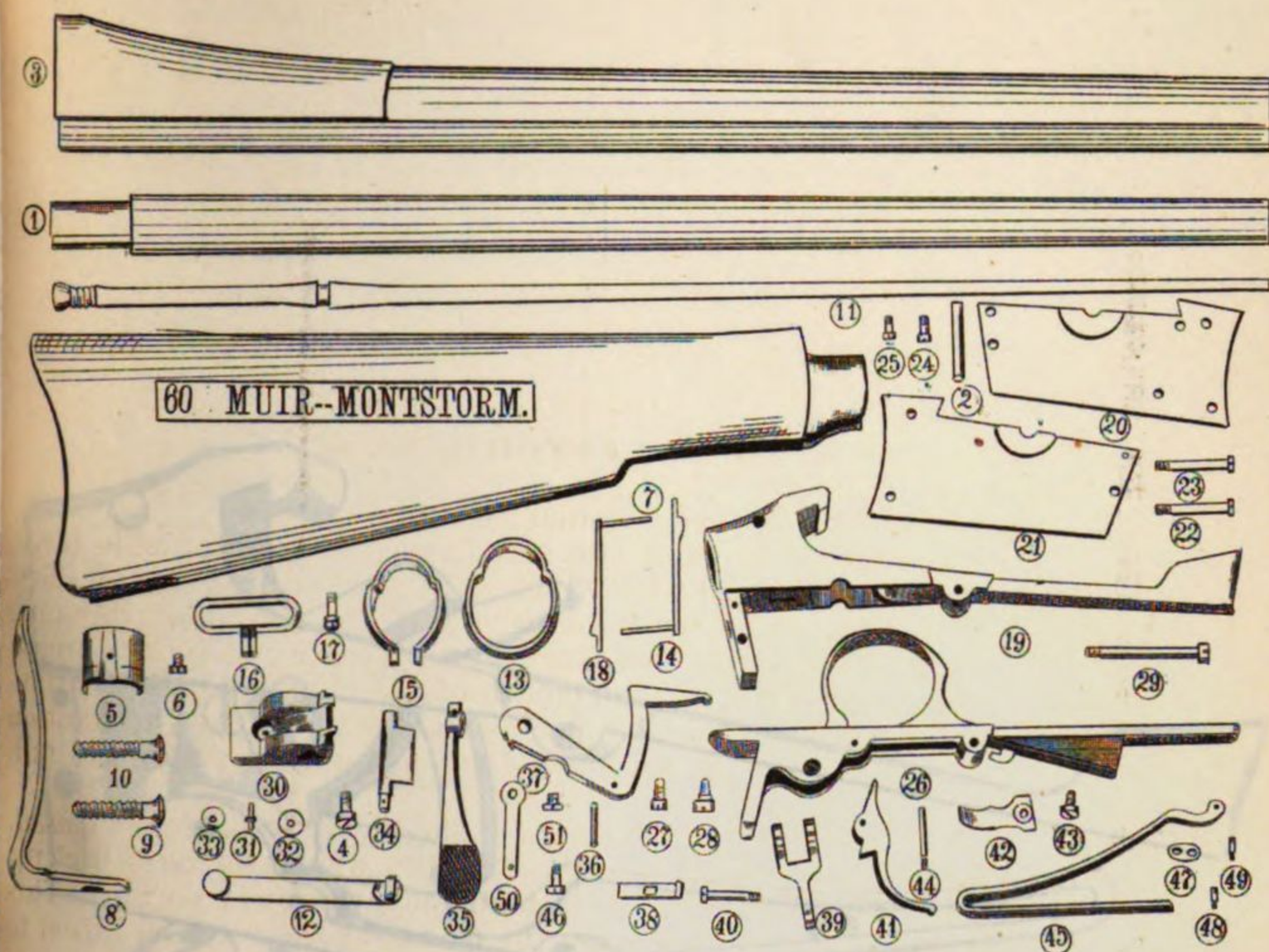
Opened.—The breech-block of this arm is moved by an outside lever, the interior shaft connected with which is cam-shaped, so that the first motion of opening draws down the breech-block, until a lip on its upper surface is clear of a hook or jaw formed on the under side of a projection of the frame overhanging the mouth of the chamber. By continuing the motion of the lever, the breech is fully exposed by the rotation of the block, the hammer at the same time being brought to the full-cock.

Closed.—By reversing the movement of the lever the breech is closed.

Locked.—The breech-block is locked by the abutment of its back up on the frame. The back is partly flattened near the lower corner. This flat surface coming in contact with the frame, as the block is raised to engage with the hook or jaw above referred to, prevents the rotation of the block until it is depressed by the regular motion of opening.

Fired.—The lock is essentially of the usual form of center-locks.

Extraction and ejection.—By a sliding extractor in the lower side of the barrel. Its under side is notched for the upper end of a lever, which is pivoted on the same pin as the hammer. This lever has two horizontal arms, which are struck by corresponding prongs on the lower side of the block, in opening the piece.



39 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 3 Tip Stock,
- 7 Butt Stock.

THIRTEEN principal metallic parts not otherwise mentioned:

- 19 Frame,
- 20 Side Plate, Right
- 21 Side Plate, Left
- 26 Guard Plate,
- 30 Breech Block,
- 31 Firing Pin,
- 34 Cam Shaft,
- 35 Lever,
- 37 Hammer,
- 38 Extractor,
- 39 Extractor Lever,

- 41 Trigger,
- 47 Main Spring Swivel.

SIXTEEN Screws:

- 4 Tip Stock Screw,
- 22 Side Plate Screw,
- 23 Side Plate Screw,
- 24 Side Plate Screw,
- 25 Side Plate Screw,
- 27 Guard Plate Screw,
- 28 Guard Plate Screw,
- 29 Tang Screw,
- 32 Firing Pin Nut,
- 40 Extractor Lever Screw,
- 43 Trigger Spring Screw,
- 44 Trigger Screw,
- 46 Main Spring Screw,

- 48 Main Spring Swivel Scr.,
- 49 Main Spring Swivel Scr.,
- 51 Spring Lever Catch Scr.

Two Pins:

- 2 Barrel Pin,
- 36 Lever Pin.

FOUR Springs:

- 33 Firing Pin Spring,
- 42 Trigger Spring,
- 45 Main Spring,
- 50 Spring Lever Catch.

Two other minor parts:

- 20 Side Plate, Right Dowel Pin,
- 21 Side Plate, Left Dowel Pin.

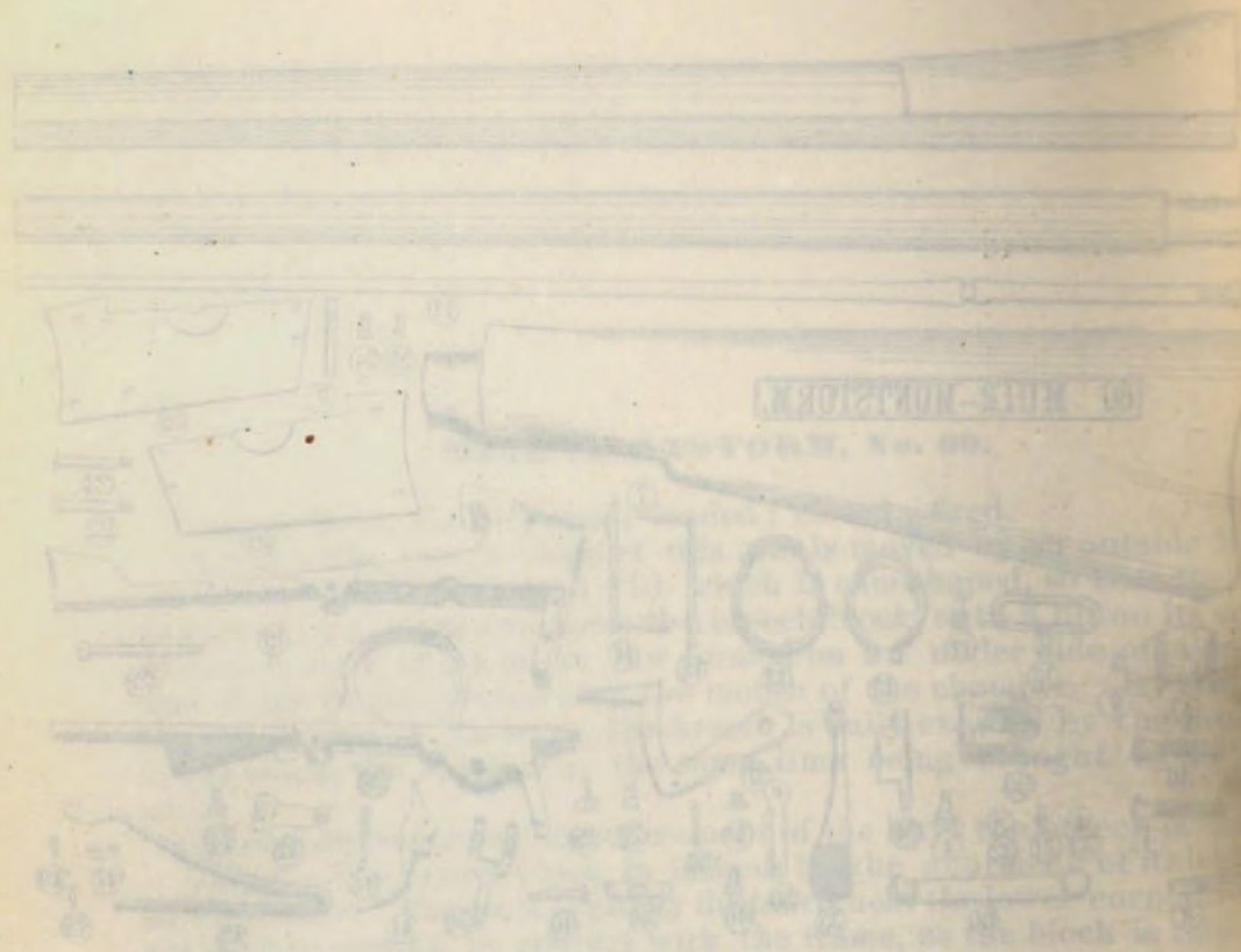
14 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 5 Tip,
- 6 Tip Screw,
- 8 Butt Plate,
- 9 Butt Plate Screw,

- 10 Butt Plate Screw,
- 11 Ramrod,
- 12 Ramrod Stop,
- 13 Lower Band,
- 14 Lower Band Spring,

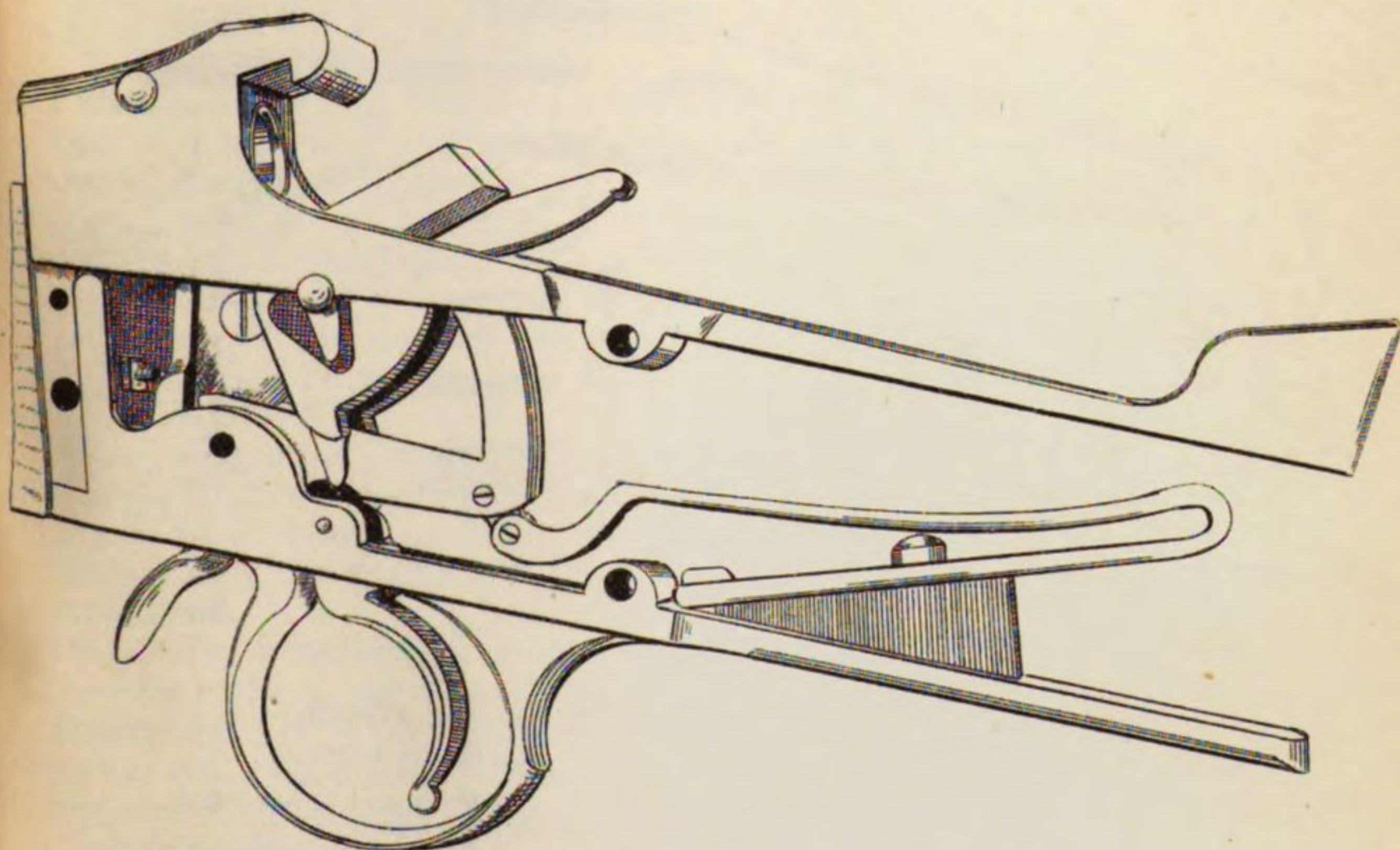
- 15 Upper Band,
- 16 Upper Band Swivel,
- 17 Upper Band Swivel Scr.,
- 18 Upper Band Spring.

MUIR-MONTSTORM, No. 60.

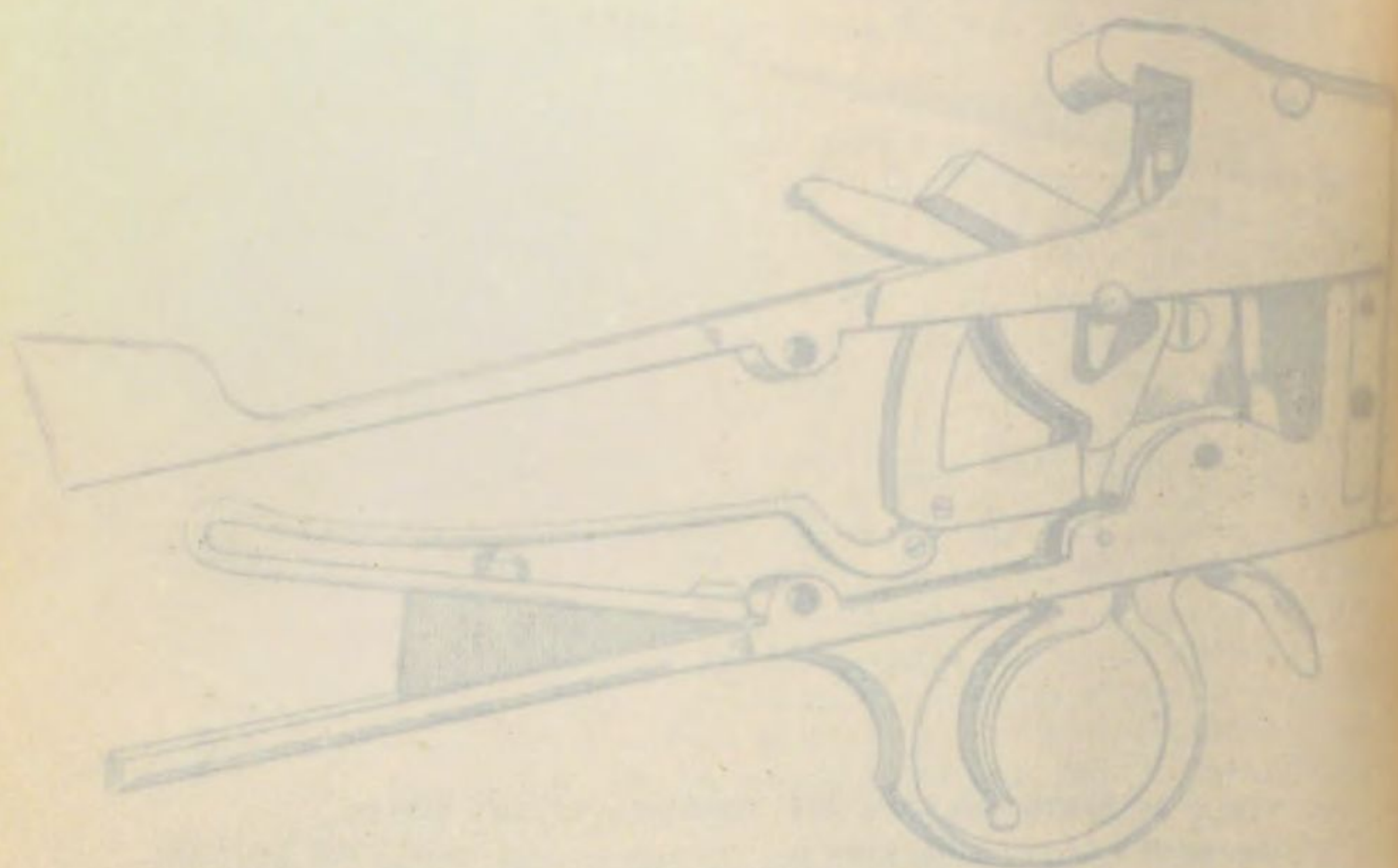


PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL.		PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL.	
1	Upper band	1	Upper band
2	Lower band	2	Lower band
3	Upper band	3	Upper band
4	Lower band	4	Lower band
5	Upper band	5	Upper band
6	Lower band	6	Lower band
7	Upper band	7	Upper band
8	Lower band	8	Lower band
9	Upper band	9	Upper band
10	Lower band	10	Lower band
11	Upper band	11	Upper band
12	Lower band	12	Lower band
13	Upper band	13	Upper band
14	Lower band	14	Lower band
15	Upper band	15	Upper band
16	Lower band	16	Lower band
17	Upper band	17	Upper band
18	Lower band	18	Lower band
19	Upper band	19	Upper band
20	Lower band	20	Lower band
21	Upper band	21	Upper band
22	Lower band	22	Lower band
23	Upper band	23	Upper band
24	Lower band	24	Lower band
25	Upper band	25	Upper band
26	Lower band	26	Lower band
27	Upper band	27	Upper band
28	Lower band	28	Lower band
29	Upper band	29	Upper band
30	Lower band	30	Lower band
31	Upper band	31	Upper band
32	Lower band	32	Lower band
33	Upper band	33	Upper band
34	Lower band	34	Lower band
35	Upper band	35	Upper band
36	Lower band	36	Lower band
37	Upper band	37	Upper band
38	Lower band	38	Lower band
39	Upper band	39	Upper band
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45	Upper band	45	Upper band
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52	Lower band	52	Lower band
53	Upper band	53	Upper band
54	Lower band	54	Lower band
55	Upper band	55	Upper band
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57	Upper band	57	Upper band
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93	Upper band	93	Upper band
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98	Lower band	98	Lower band
99	Upper band	99	Upper band
100	Lower band	100	Lower band

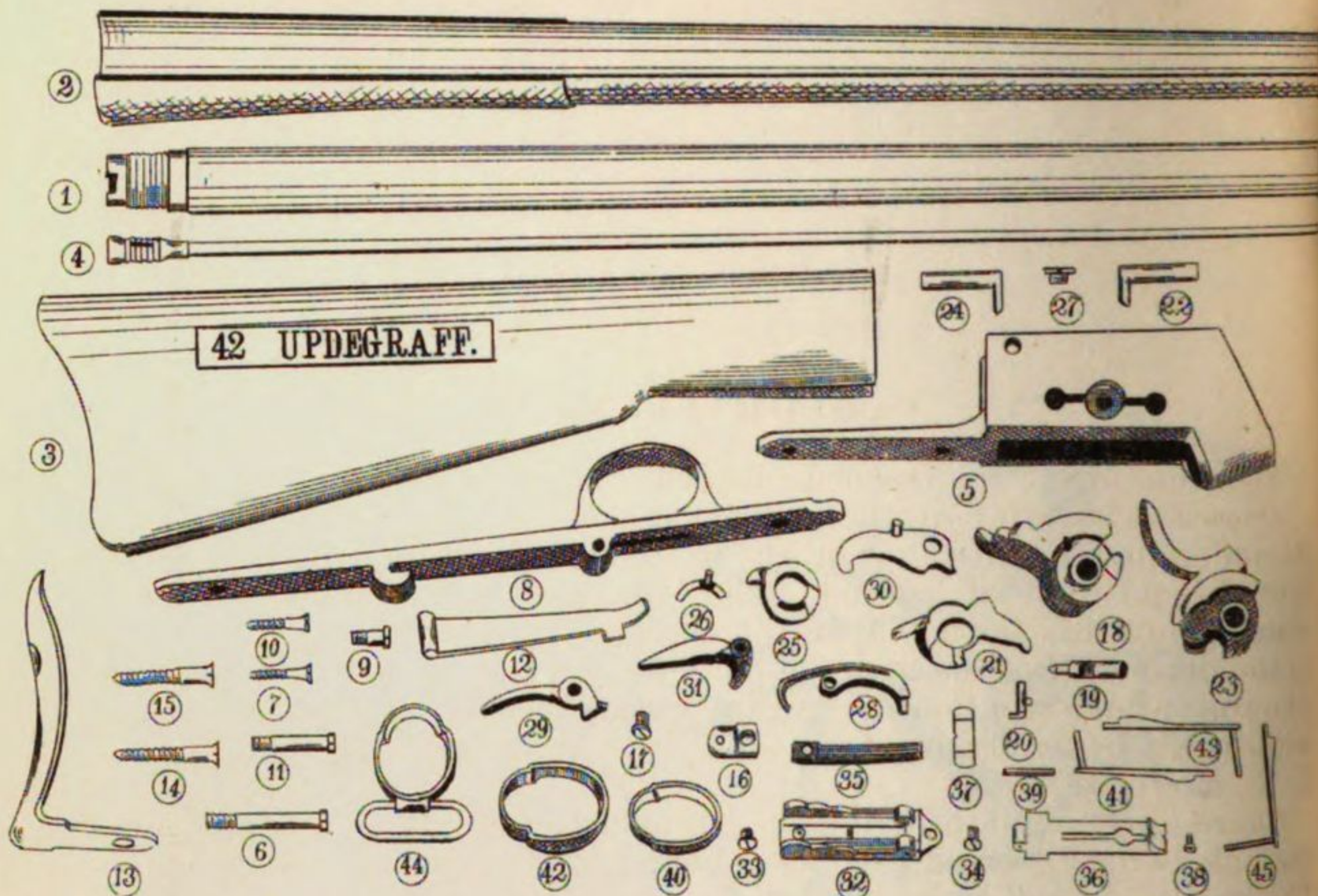
MILLS-MORRISON, No. 25



60 MUIR--MONTSTORM.



60 MUIR-MONTSTORM.



30 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 2 Tip Stock,
- 3 Butt Stock.

TWELVE principal metallic parts not otherwise mentioned:

- 5 Frame,
- 18 Breech Block,
- 19 Firing Pin,
- 20 Firing Pin Retractor,
- 23 Hammer,
- 25 Pawl,
- 8 Guard Plate,
- 11 Side Screw,
- 21 Extractor,

- 29 Trigger,
- 30 Hammer and Br'ch Block Links,
- 31 Hammer and Br'ch Block Links.

SIX Screws :

- 27 Hammer and Br'ch Block Pin Screw,
- 9 Guard Plate Scr., Upper
- 10 Guard Plate Scr., Lower
- 6 Tang Screw,
- 7 Upper Butt Stock Screw,
- 17 Recoil Stud Screw.

SIX Pins :

- 5 Lever Pin,

- 5 Lever Pin,
- 5 Lever Pin,
- 22 Breech Block Pin,
- 24 Hammer Pin,
- 26 Pawl Stop Pin.

Two Springs :

- 28 Friction Lever and Trigger Spring,
- 12 Main Spring.

Two other minor parts :

- 16 Recoil Stud,
- 16 Recoil Stud Dowel Pin.

22 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel and Front Sight,
- 4 Ramrod,
- 13 Butt Plate,
- 14 Butt Plate Screw,
- 15 Butt Plate Screw,
- 40 Upper Band,
- 41 Upper Band Spring,

- 44 Middle Band, Swivel and Pin,
- 43 Middle Band Spring,
- 42 Lower Band,
- 45 Lower Band Spring,
- 32 Rear Sight Base,
- 33 Rear Sight Base Screw,

- 34 Rear Sight Base Screw,
- 35 Rear Sight Spring,
- 36 Rear Sight Leaf,
- 37 Rear Sight Leaf Slide,
- 38 Rear Sight Leaf Screw,
- 39 Rear Sight Joint Pin.

UPDEGRAFF, No. 42.

UPDEGRAFF, No. 42.

Four motions, viz: Opened; loaded; closed; fired.

Opened.—By bringing the hammer to the full-cock, a link connecting its under surface with that of the breech-block throws the latter down into the position of loading. The hammer when released moves forward to the half-cock notch, and changes its point of bearing on the block to the other side of the center of motion, by engaging with a second link like that above mentioned. As the breech-block opens, the firing-pin is withdrawn by an arrangement similar to that employed in No. 82, (R. L. R., model 1871.)

Closed.—By again bringing the hammer to the full-cock, the action of the link being reversed from the change of its bearing on the block. This can also be done by hand in the usual way.

Locked.—By the descent of the hammer beneath the block when the piece is fired.

Fired.—By a center-lock of the usual pattern; the trigger-spring being formed by a slit in the side of the friction-lever.

Extraction.—By a disk pivoted on a hub formed on the side of the breech-block, and provided with the necessary radial arms. This disk is recessed for the head of the firing-pin retractor, which it operates in the usual manner.

Ejection.—Is secured by accelerating the movement of the extractor, by a quick blow which it receives from the nearest link, at its release in the act of opening the piece.

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BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER CLOSED BY A MOVABLE BREECH-BLOCK, WHICH ROTATES ABOUT A HORIZONTAL AXIS AT 90° TO THE AXIS OF THE BARREL, LYING BELOW THE AXIS OF THE BARREL AND IN FRONT.

2.—MOVED FROM BELOW BY A LEVER.

SPENCER.

BROUGHTON, No. 18.

ROBERTSON.

EVANS.

KIRK.

G. R. REMINGTON.

SPENCER, No. 30.

Five motions, viz: Opened; loaded; closed; cocked; fired.

Opened.—By depressing the lever it is caused to swing around the knuckle-joint in the breech-block in which it is imbedded, until the rear end of its body is disengaged from a corresponding notch in the back of the frame; the projecting lip in front of the body of the lever, then strikes the shoulder formed on the under surface of the breech-block, and both pieces revolve together about the axis of the block until the chamber is exposed. In depressing the lever, a notch in the upper side of the joint of the lever, engages with a corresponding notch in the lower side of the firing-pin, and thus retracts it. The back of the breech-block bears against the face of the hammer in opening, and brings it to the half-cock.

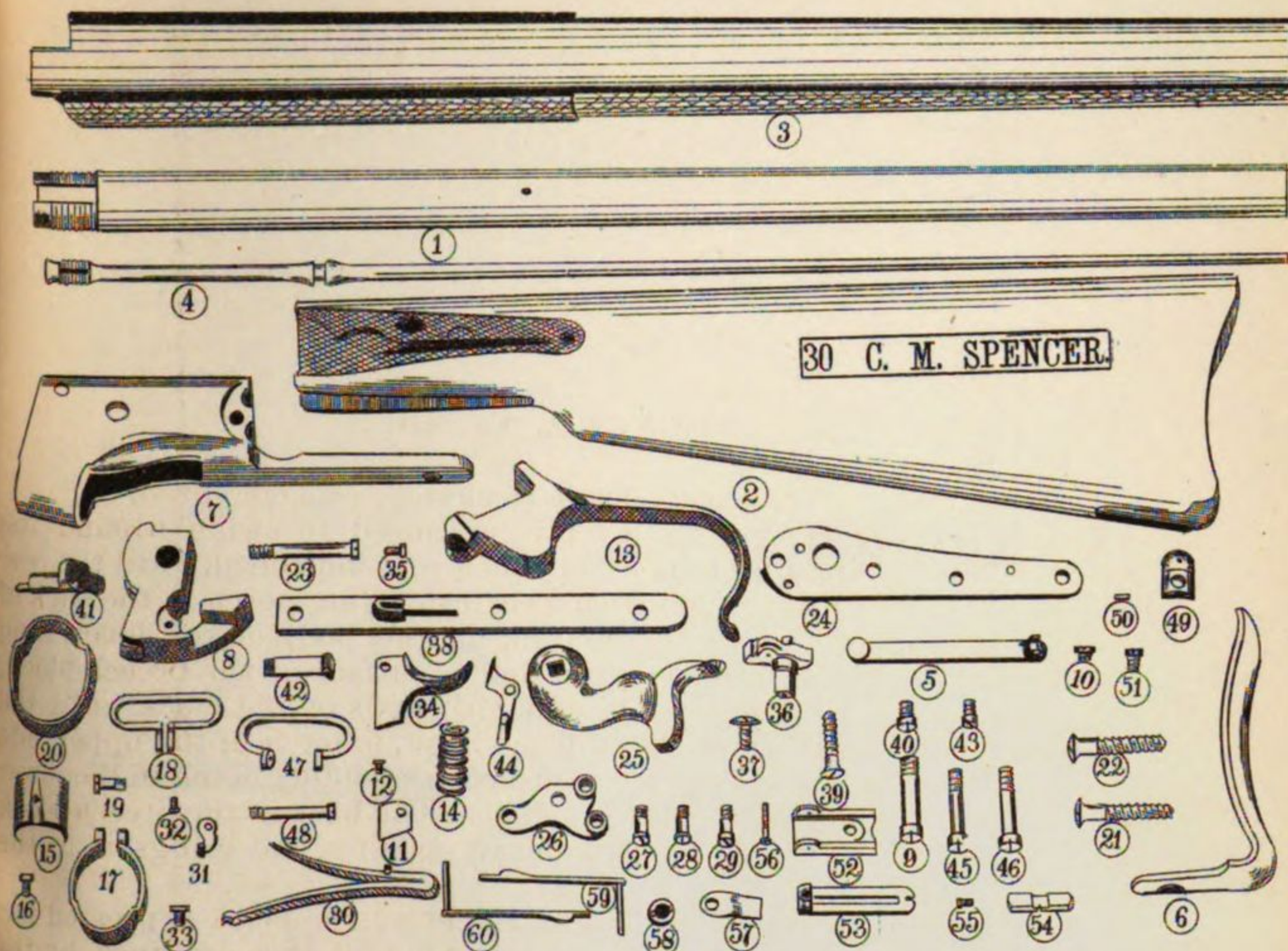
Closed.—By reversing the action of the lever, the block is pressed forward against the mouth of the chamber, where it is maintained by the action of the spiral-lever spring, which is inclosed between the face of the body of the lever and the block, and which keeps the rear end of the body pressed into its notch in the frame.

Locked.—By the support afforded the block, by the resting of the body of the lever-guard upon its notch in the frame.

Fired.—By a back-action side-lock of the usual pattern.

Extraction.—By an extractor sliding under the barrel, and having on its lower side a stud, playing in a groove in the hub of the breech-block.

Ejection.—By rapid motion of parts in opening.



39 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood:

- 2 Butt Stock.
- 3 Tip Stock.

FOURTEEN principal metallic parts not otherwise mentioned:

- 8 Breech Block,
- 11 Breech Block Firing Pin Cap,
- 7 Frame,
- 13 Lever,
- 41 Firing Pin,
- 42 Extractor,
- 24 Lock Plate,
- 25 Hammer,
- 26 Bridle,
- 38 Trigger Plate,

- 44 Sear,
- 34 Trigger,
- 36 Tumbler,
- 31 Main Spring Swivel.

SIXTEEN Screws.

- 10 Breech Block Pin Screw,
- 12 Breech Block Firing Pin Cap Screw,
- 43 Extractor Screw,
- 45 Side Screw,
- 46 Side Screw,
- 27 Bridle Screw,
- 28 Bridle Screw,
- 29 Bridle Screw,
- 32 Main Spring Swivel Scr.,
- 33 Main Spring Stop Screw,

- 39 Trigger Plate Screw,
- 40 Trigger Plate Screw,
- 35 Trigger Screw,
- 37 Tumbler Screw,
- 51 Recoil Stud Screw,
- 23 Tang Screw.

ONE Pin:

- 9 Breech Block Pin.

TWO Springs:

- 14 Lever Spring,
- 30 Main Spring.

FOUR other minor parts:

- 2 Side Screw Washer,
- 2 Side Screw Washer,
- 50 Recoil Stud Dowel Pin,
- 19 Recoil Stud.

24 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

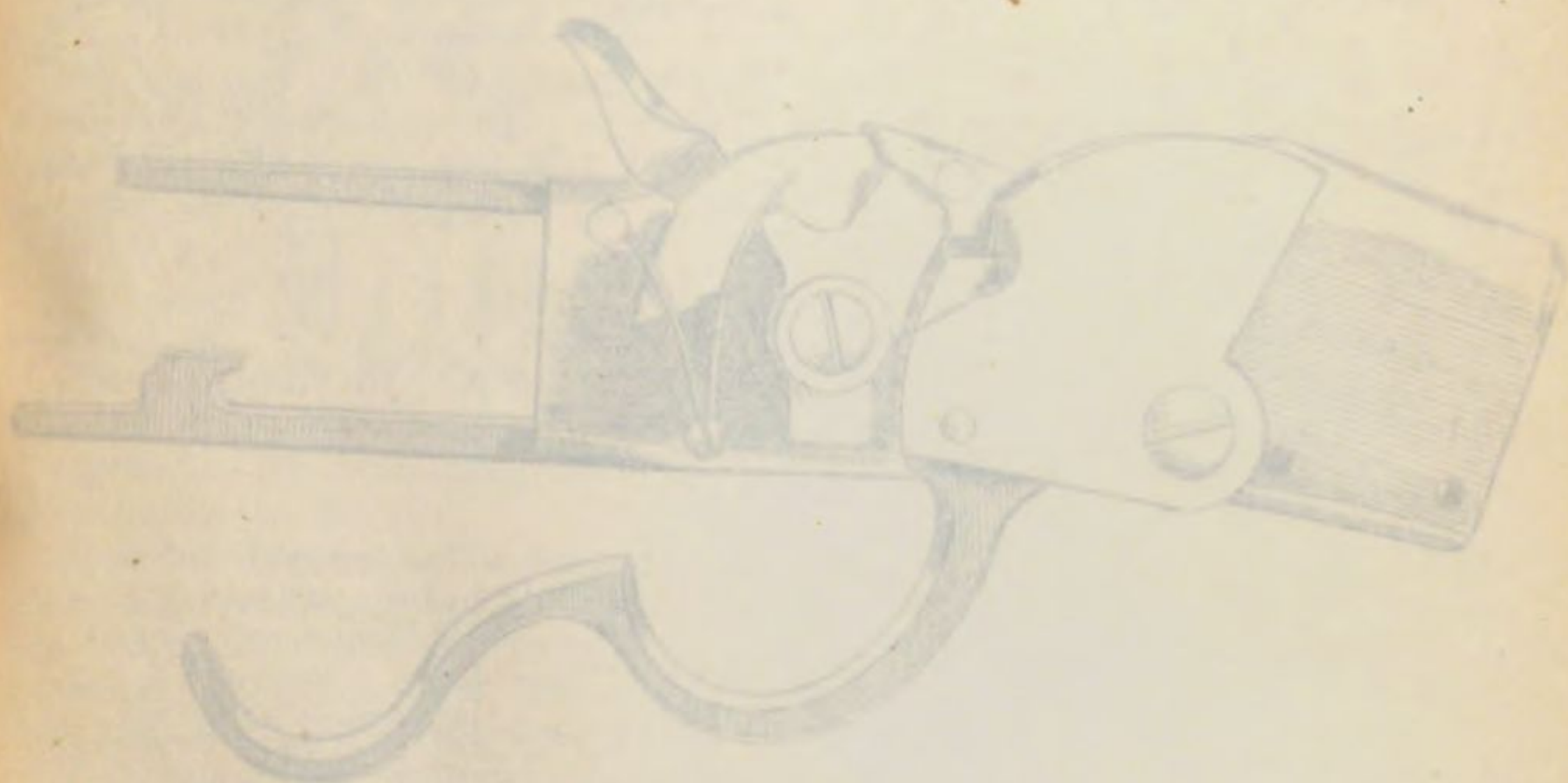
- 1 Barrel and Front Sight,
- 4 Ramrod,
- 6 Butt Plate,
- 21 Butt Plate Screw,
- 22 Butt Plate Screw,
- 52 Rear Sight Base,
- 53 Rear Sight Leaf,
- 54 Rear Sight Leaf Slide,

- 55 Rear Sight Leaf Screw,
- 56 Rear Sight Joint Screw,
- 57 Rear Sight Base Screw,
- 58 Rear Sight Spring,
- 15 Tip,
- 16 Tip Screw,
- 17 Upper Band,
- 18 Upper Band Swivel,

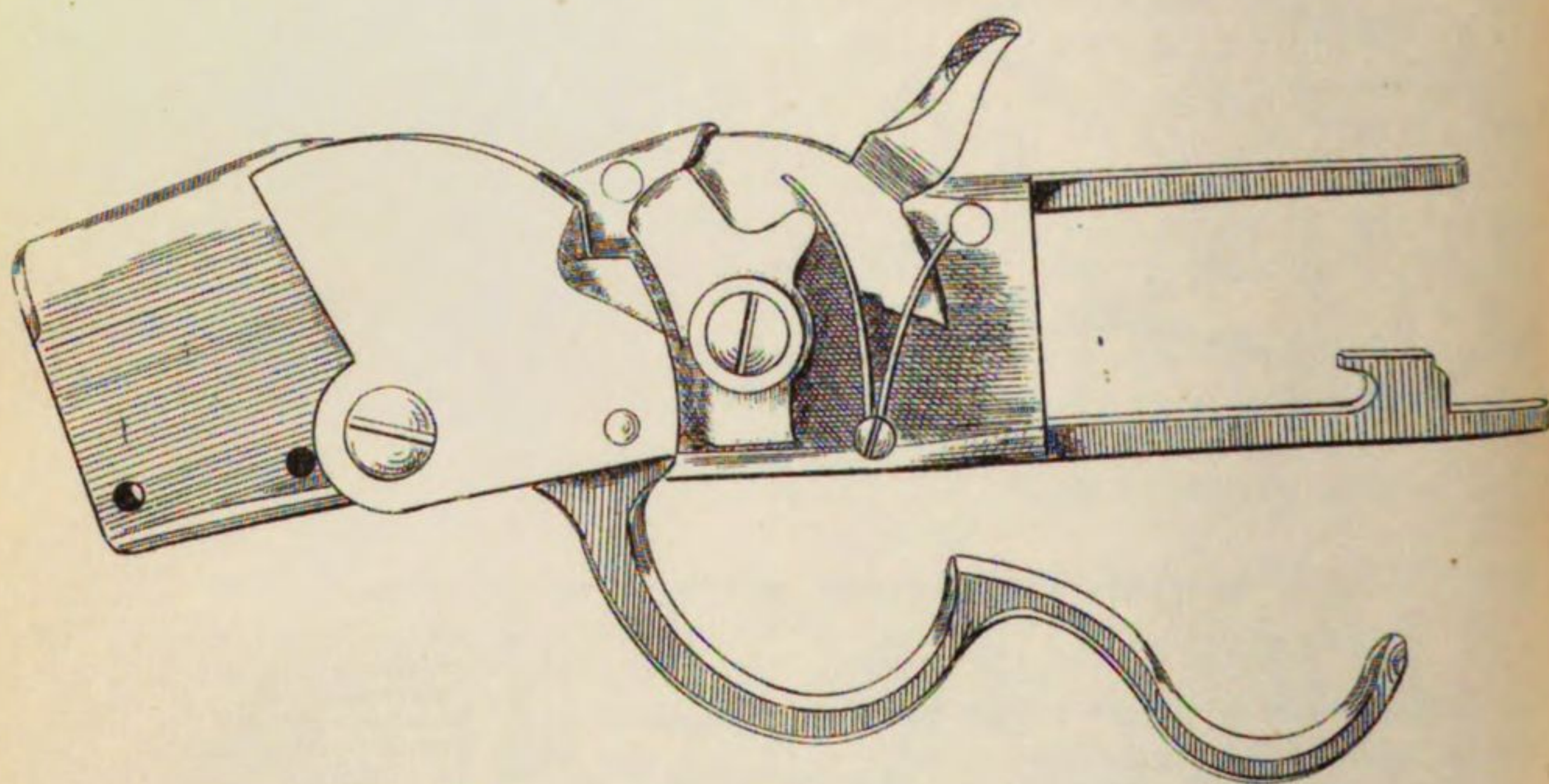
- 19 Upper Band Swivel Scr.,
- 20 Lower Band,
- 59 Upper Band Spring,
- 60 Lower Band Spring,
- 47 Frame Swivel,
- 48 Frame Swivel Screw,
- 5 Ramrod Stop.

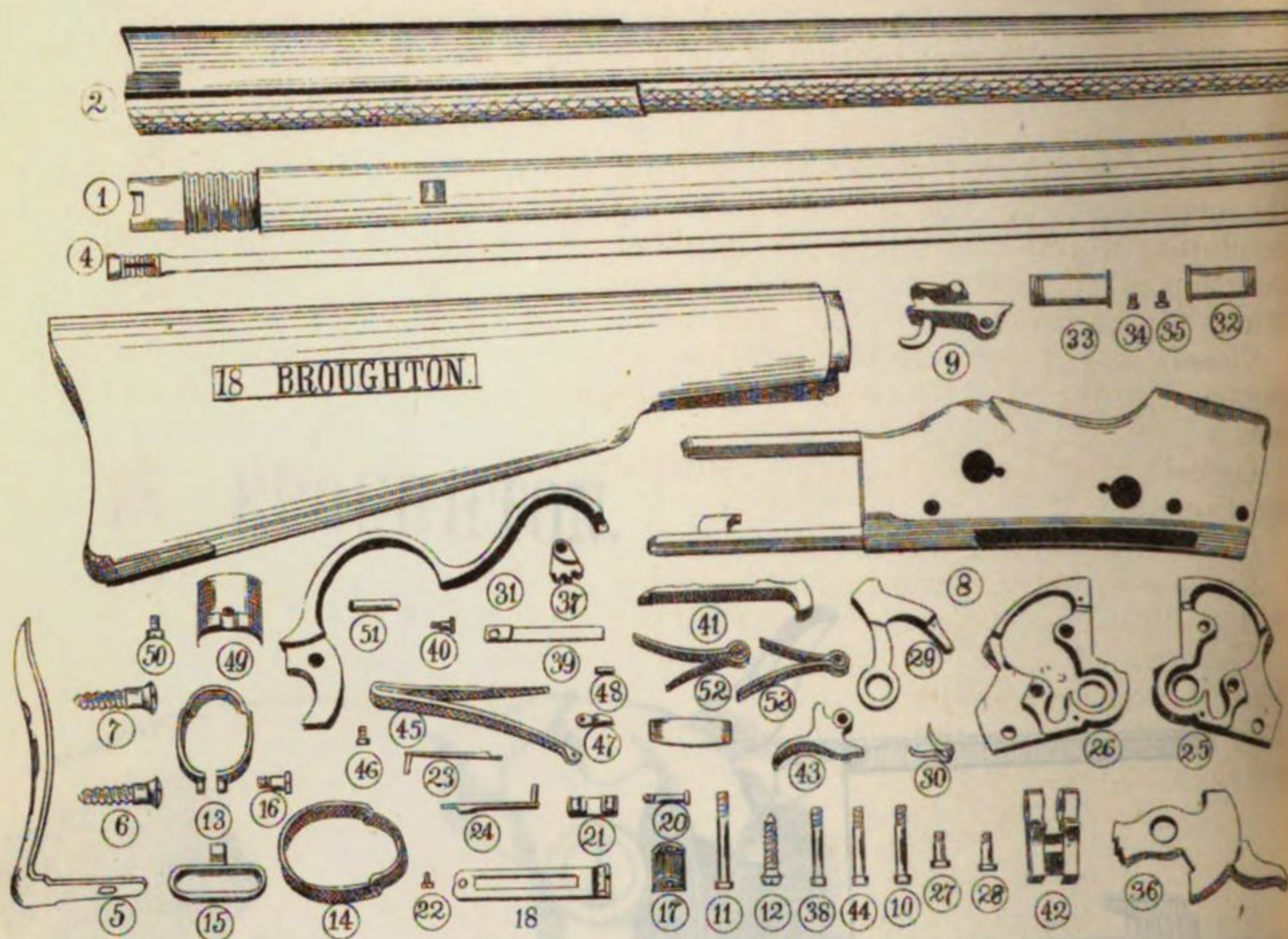
C. M. SPENCER, No. 30.

18 BROUGHTON.



18 BROUGHTON.





32 PARTS PECULIAR AND ESSENTIAL TO THE SYSTEM.

Two of Wood :

- 2 Tip Stock,
- 3 Butt Stock.

ELEVEN principal metallic parts not otherwise mentioned :

- 25 Breech Block, Right section,
- 26 Breech Block, Left section,
- 29 Firing Pin,
- 31 Lever,
- 36 Hammer,
- 41 Extractor,
- 37 Extractor Pinion,

- 42 Locking Brace,
- 43 Trigger,
- 47 Main Spring Swivel,
- 8 Frame.

TEN Screws :

- 27 Breech Block Screw,
- 28 Breech Block Screw,
- 34 Breech Block Pin Screw,
- 35 Hammer Pin Screw,
- 38 Extractor Pinion Screw,
- 40 Extractor Pinion Spring Screw,
- 44 Trigger Screw,
- 46 Main Spring Set Screw,

- 11 Tang Screw, Upper
- 12 Tang Screw, Lower

FOUR Pins :

- 32 Breech Block Pin,
- 48 Main Spring Swivel Pin,
- 51 Lever Pin,
- 33 Hammer Pin.

FIVE Springs :

- 52 Locking Brace Spring,
- 53 Locking Brace Spring,
- 30 Firing Pin Spring,
- 39 Extractor Pinion Spring,
- 45 Main Spring.

25 PARTS NOT PECULIAR TO THE SYSTEM, OR COMMON TO ALL ARMS.

- 1 Barrel, Front Sight and Recoil Stud,
- 4 Ramrod,
- 5 Butt Plate,
- 6 Butt Plate Screw,
- 7 Butt Plate Screw,
- 13 Upper Band,
- 23 Upper Band Spring,

- 14 Lower Band,
- 24 Lower Band Spring,
- 15 Band Swivel,
- 16 Band Swivel Screw,
- 49 Tip,
- 50 Tip Screw,
- 17 Rear Sight Base,
- 18 Rear Sight Leaf,

- 21 Rear Sight Leaf Slide,
- 22 Rear Sight Leaf Slide Scr.,
- 19 Rear Sight Spring,
- 20 Rear Sight Joint Screw,
- 9 Swivel Plate, Swivel and Pin,
- 10 Swivel Plate Screw.

BROUGHTON, No. 18.

BROUGHTON, No. 18.

Five motions, viz: Opened; loaded; closed; cocked; fired.

Opened.—By the first motion of depressing the lever, which is pivoted on the breech-block near its rearmost corner, its upper end presses back the locking-brace from under the block. It thus allows the block to swing downward and backward, as soon as by the continued motion of the lever, it strikes the under surface of the block so as to cause its revolution about the block-pin, and to expose the chamber for the insertion of the charge. As the locking-brace is pushed back it also brings the hammer to the half-cock.

Closed.—By reversing the motion of the lever, the locking-brace engages under the breech-block, the hammer remaining at the half-cock.

Locked.—By the locking-brace falling under the breech-block, as above mentioned.

Fired.—By a tang-lock of the usual pattern.

Extraction.—By a projection on the hub of the breech-block engaging with a sliding extractor underneath the barrel.

Ejection.—A rack on the extractor operates a pinion, the journal of which being cam-shaped, is acted on by a flat spring, so as to reciprocally accelerate the motion of the extractor, and thereby to forcibly expel the cartridge shell from the piece.

ROBERTSON, No. 35.

Five motions, viz: Opened; loaded; closed; cocked; fired. This arm was withdrawn without giving an opportunity for photographing it.

Opened.—By depressing the lever the block is pulled down by a link connecting the two.

Closed and locked.—By reversing the lever the block is raised into place against the end of the barrel, and is locked by the middle joint of the linked combination rising above the line joining the other two, and causing the strain upon the block from the discharge to tend towards bringing the lever more closely into place.

Extraction and ejection.—By a straight lever, swinging on a center below that of the block, and struck by the block during the opening, near its center of motion.

EVANS MAGAZINE, No. 4.

As a magazine, three motions, viz: Opened, closed, and fired. Withdrawn for alteration before an accurate description could be written or a photograph prepared.

The general principle is similar to that of the well-known Spencer repeater, save that the feed-motion is positive and is effected by the revolution of a fluted cylinder in the butt-stock. This cylinder holds the cartridges in its grooves, and revolves within a stationary helical coil of stout wire, the intervals of which are equal to the total length of the cartridge. Each motion of the lever in opening, being communicated through a pawl-like arrangement to the cylinder, gives it a partial turn, and causes the foremost cartridge to bear on the front surface of the coil next behind it, so that it shall be thrown out of the magazine into a position where it will be caught by the rising block, and passed into the

chamber of the gun. The motion of the lever also cocks the hammer, which is concealed.

The sample shown held thirty-eight small cartridges in a magazine running the length of the butt-stock, forming in itself the small of the stock, and loaded through a trap in the butt-plate. These were fired by a center-lock of the usual pattern, and the empty shells ejected through a hole in the side of the frame.

This arm could only be used as a single-loader, by replenishing the magazine from the rear, each time a shot was expended in front. Otherwise a gap in the succession of cartridges would occur, which could only be closed by repeated working of the lever as in firing.

KIRK, No. 37.

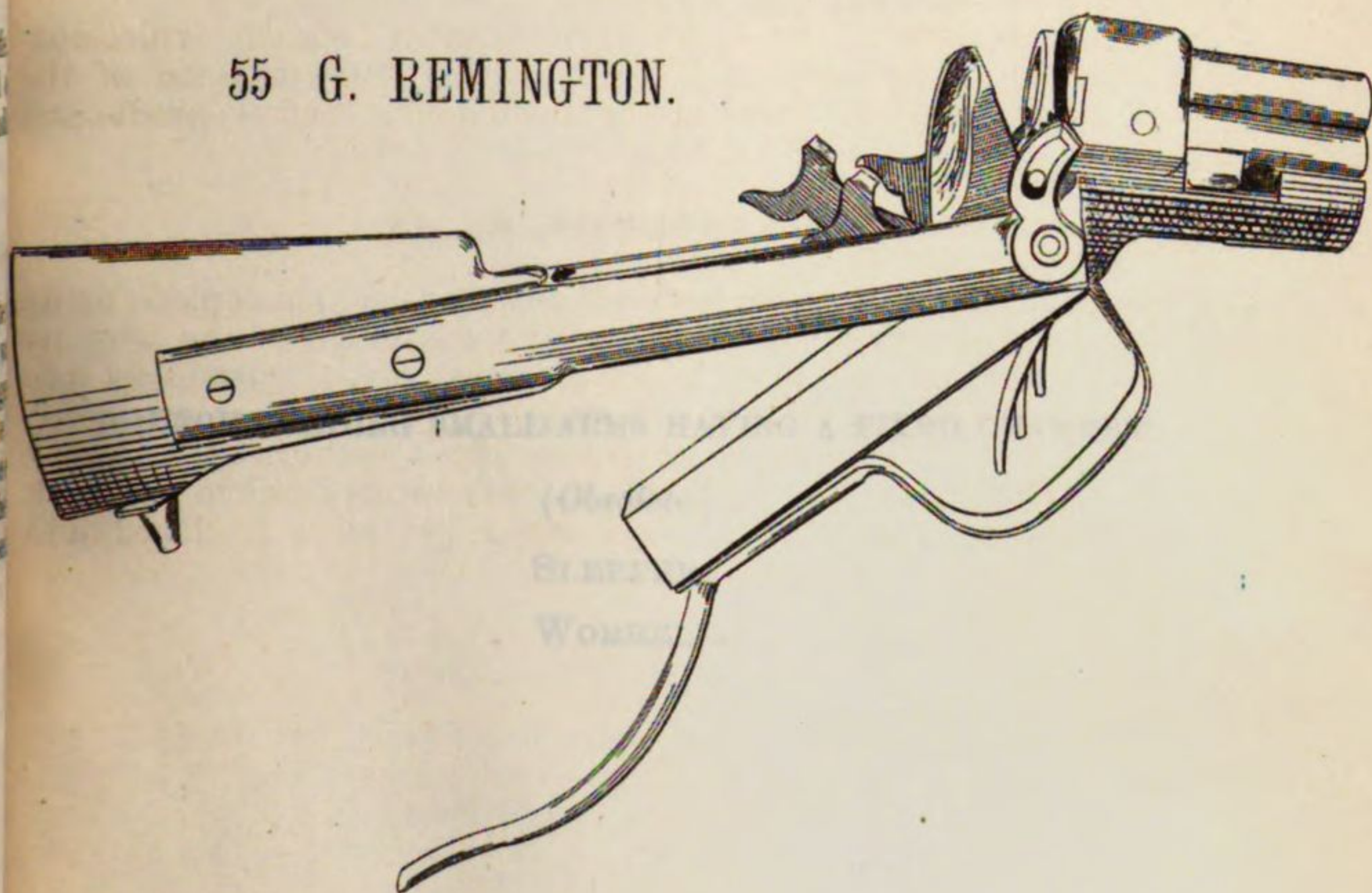
Withdrawn before being photographed.

It is a modification of the well-known Spencer repeating-rifle, containing in an unwieldy butt-stock, six magazine tubes instead of the single one usually carried. These are connected on a central spindle and revolved into place by hand.

G. R. REMINGTON, No. 55.

A wooden model of a triple barreled-gun, the locks complete being contained in the breech-block, which being lowered out of the way by the tang on its lower end, permits the insertion of the cartridges into the chambers through a perforated extractor-plate. This plate being moved by the arm on the pivot of the breech-block, withdraws the empty shells when the block is fully opened. A weak spring-catch in the stock holds up the tang of the breech-block when the piece is closed, and affords the only means of locking it.

55 G. REMINGTON.





BREECH-LOADING SMALL-ARMS HAVING A FIXED CHAMBER.

(Obsolete.)

SLEEPER.

WORRELL.

EDWIN SLEEPER, No. 1.

Wooden model.

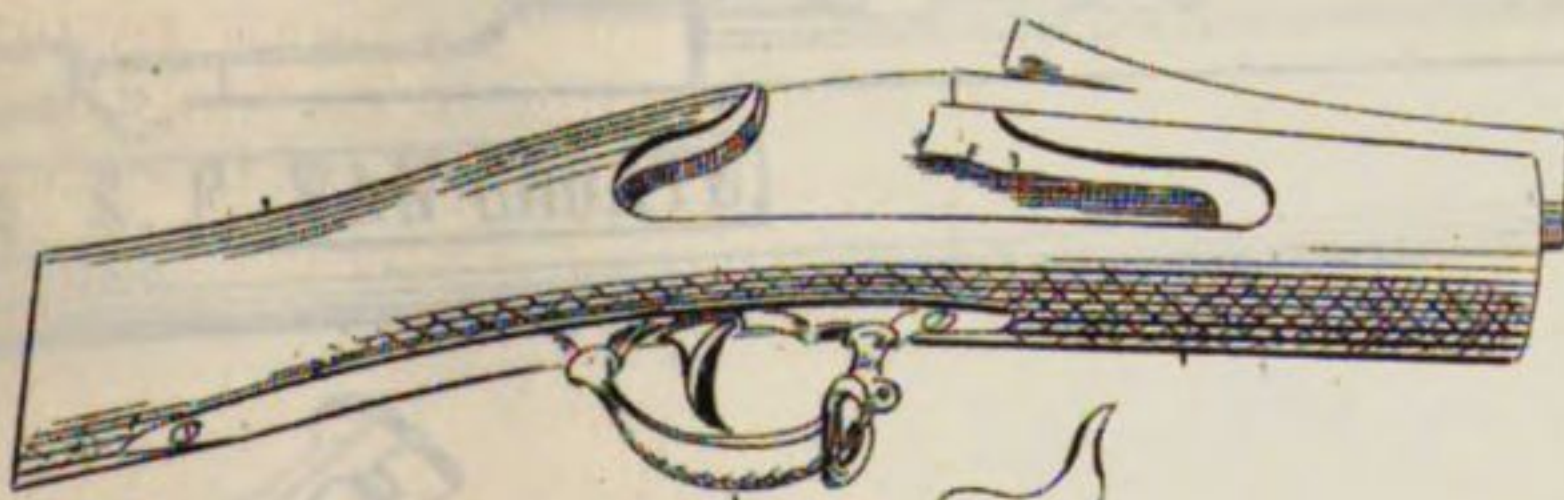
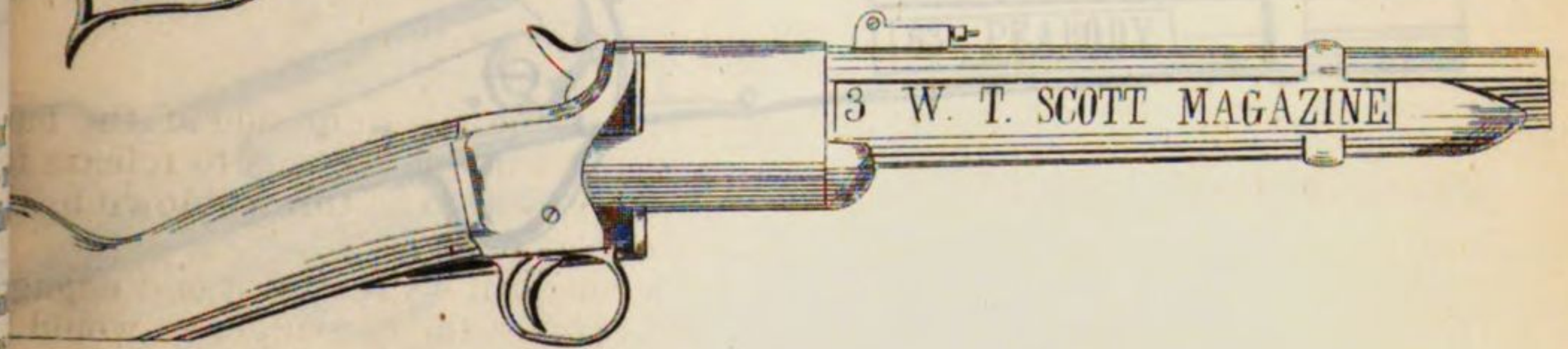
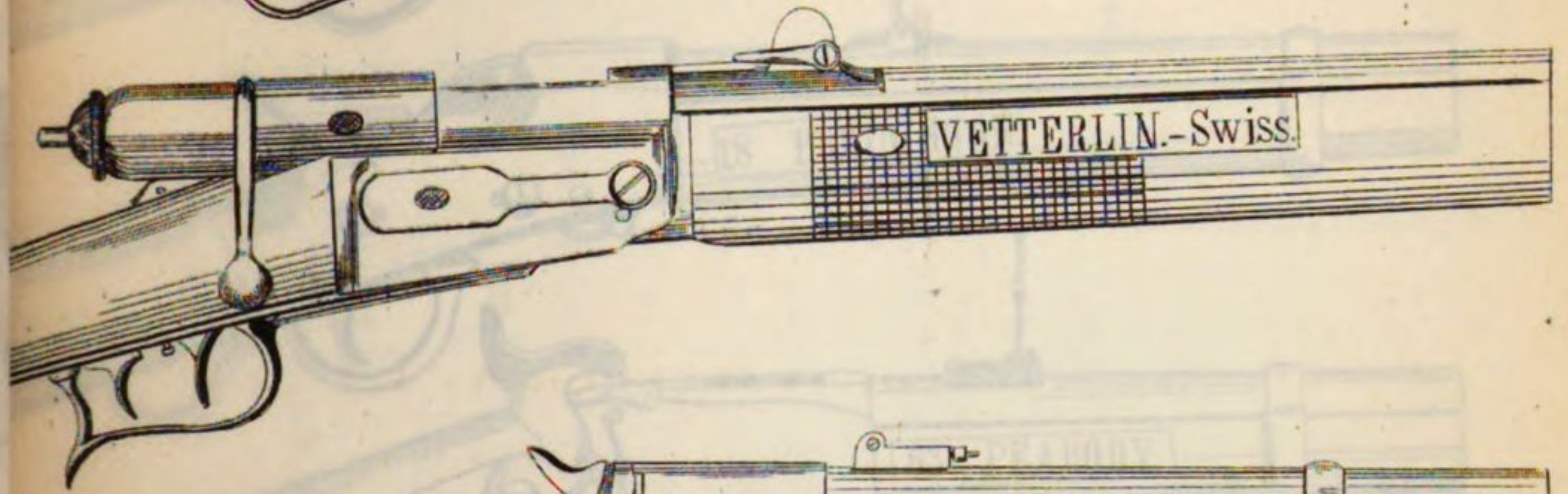
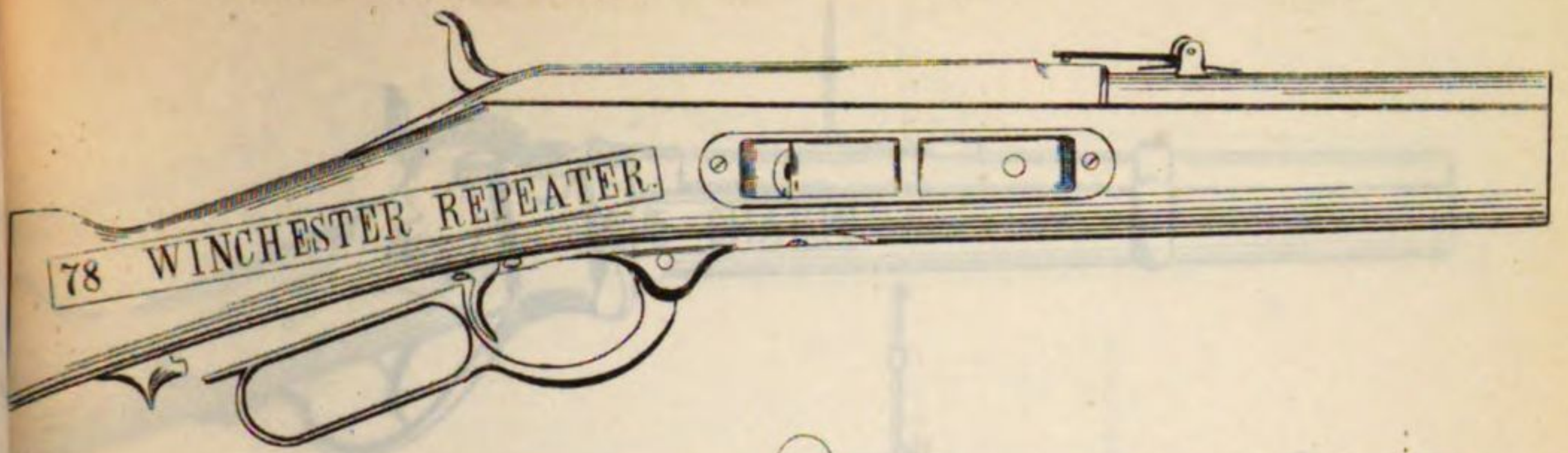
Opened.—By pressing an eccentric lever on the right side of the butt stock, and thus throwing out the spring-butt-plate, so as to release the rear end of the chamber-lever, and to allow it to be thrown down by the spring included between it and the stock.

Closed.—By closing the chamber-lever until its rearmost end engages with the butt plate, the forward end catches the cartridge, as would be done by a pair of tongs.

Lock, &c.: Rudimentary.

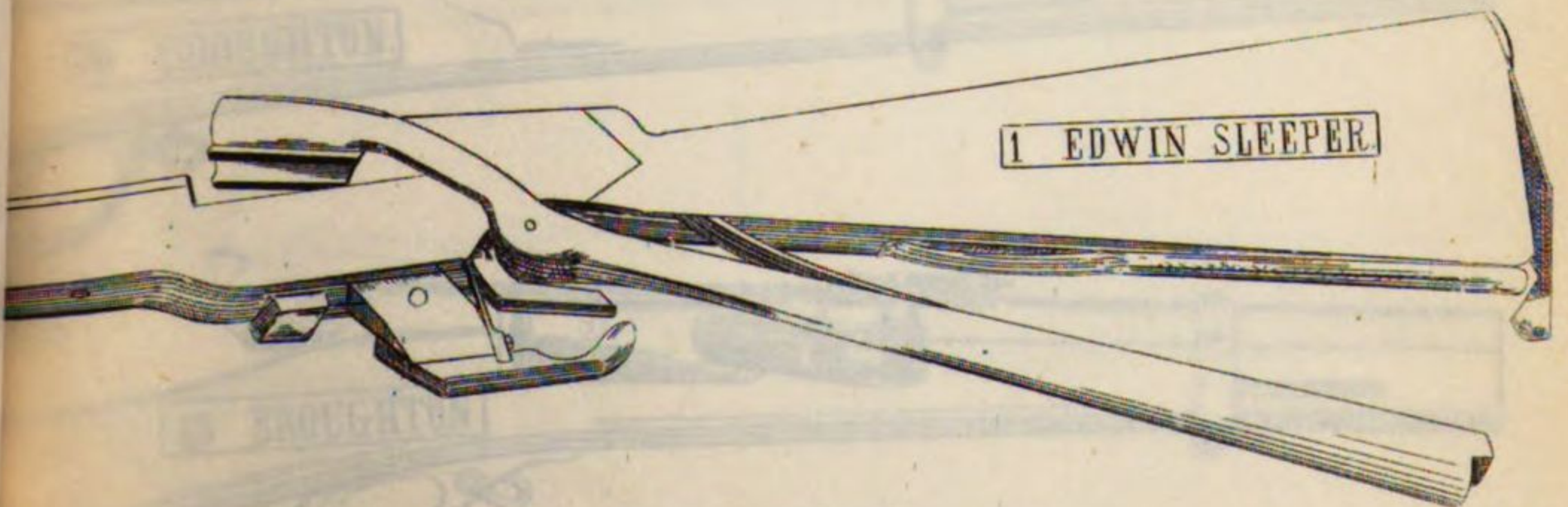
F. W. WORRELL, No. 6.

A wooden model consisting of a perforated block revolving in a mortised frame about an axis at right angles to its length. When closed the hole in the block lies in the prolongation of the bore. The model is without any indications of the means depended on for working it effectively.



72 MERRILL IMPROVED LOCK.

6 T. W. WORRELL.





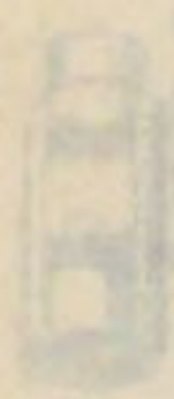
WINCHESTER, No. 1.



The cartridge is on the right side of the receiver, and the magazine is on the left side. The magazine is a tube which holds the cartridges, and it is loaded by throwing the magazine into the receiver. The magazine is loaded by the user, and it is not a part of the rifle. The magazine is a tube which holds the cartridges, and it is loaded by throwing the magazine into the receiver. The magazine is loaded by the user, and it is not a part of the rifle. The magazine is a tube which holds the cartridges, and it is loaded by throwing the magazine into the receiver. The magazine is loaded by the user, and it is not a part of the rifle.

V. W. WORRELL, No. 6.

A wooden model consisting of a perforated block revolving in a wooden frame about an axis at right angles to its length. When the block is revolved, the cartridges are thrown out of the bore. The block is loaded by the user, and it is not a part of the rifle. The block is a tube which holds the cartridges, and it is loaded by throwing the block into the receiver. The block is loaded by the user, and it is not a part of the rifle. The block is a tube which holds the cartridges, and it is loaded by throwing the block into the receiver. The block is loaded by the user, and it is not a part of the rifle.

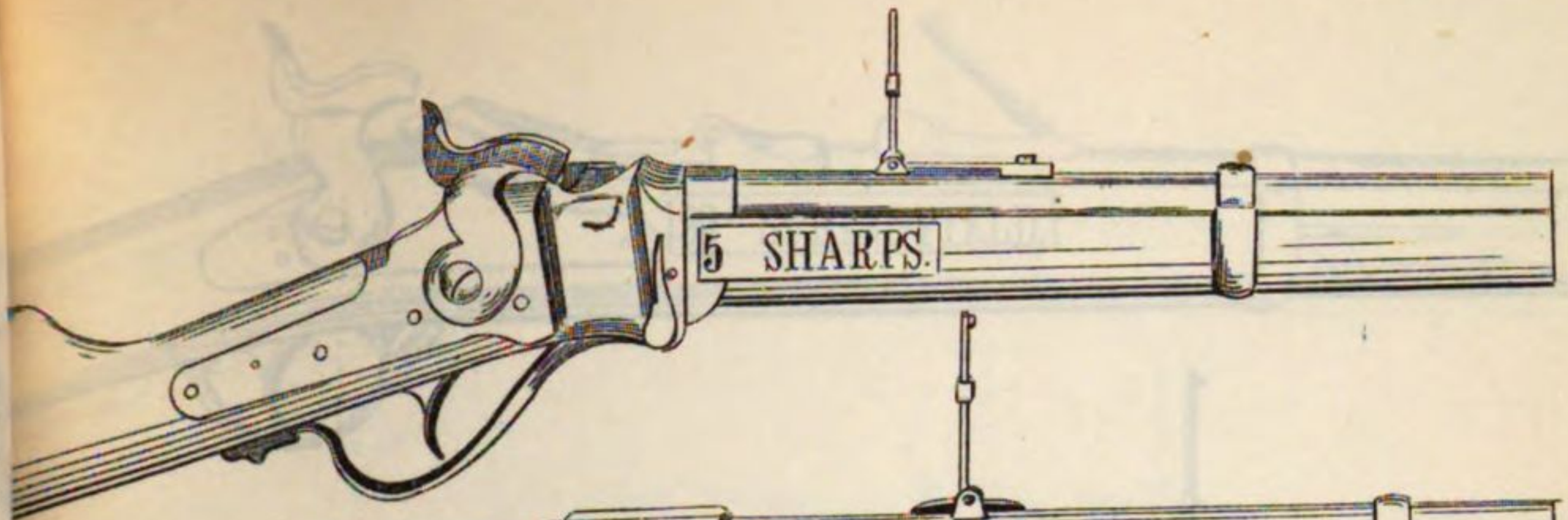


V. W. WORRELL, No. 6.

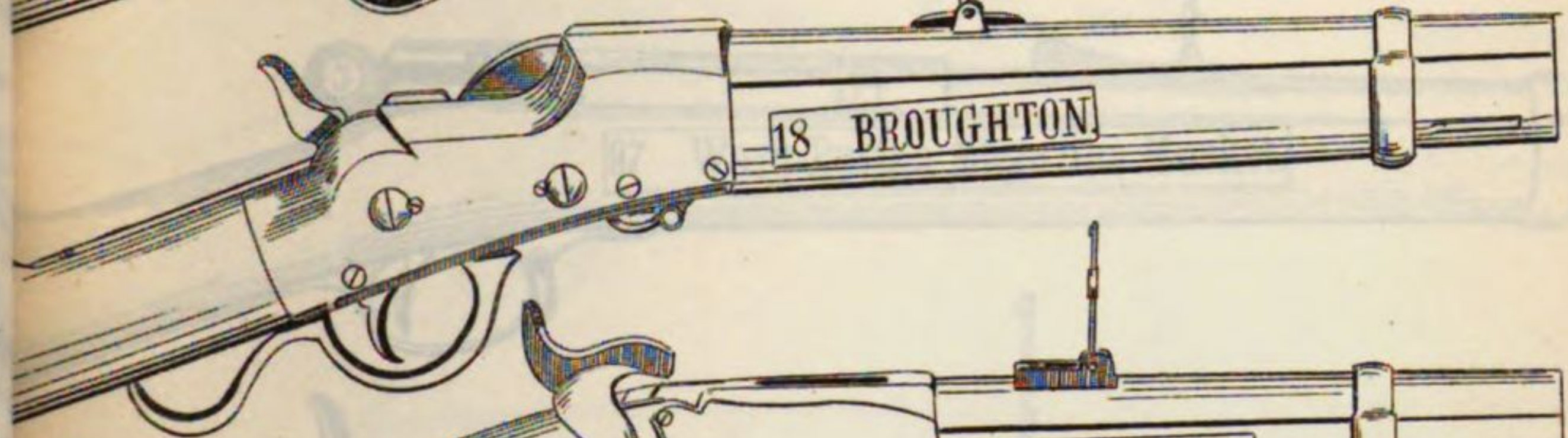
V. W. WORRELL, No. 6.



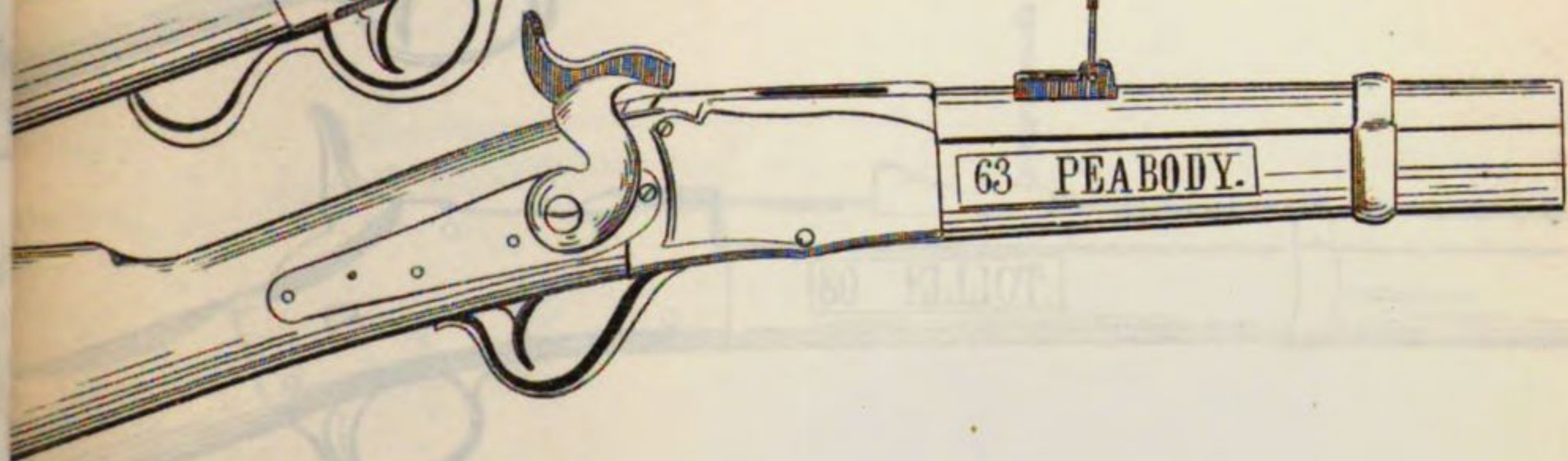
V. W. WORRELL, No. 6.



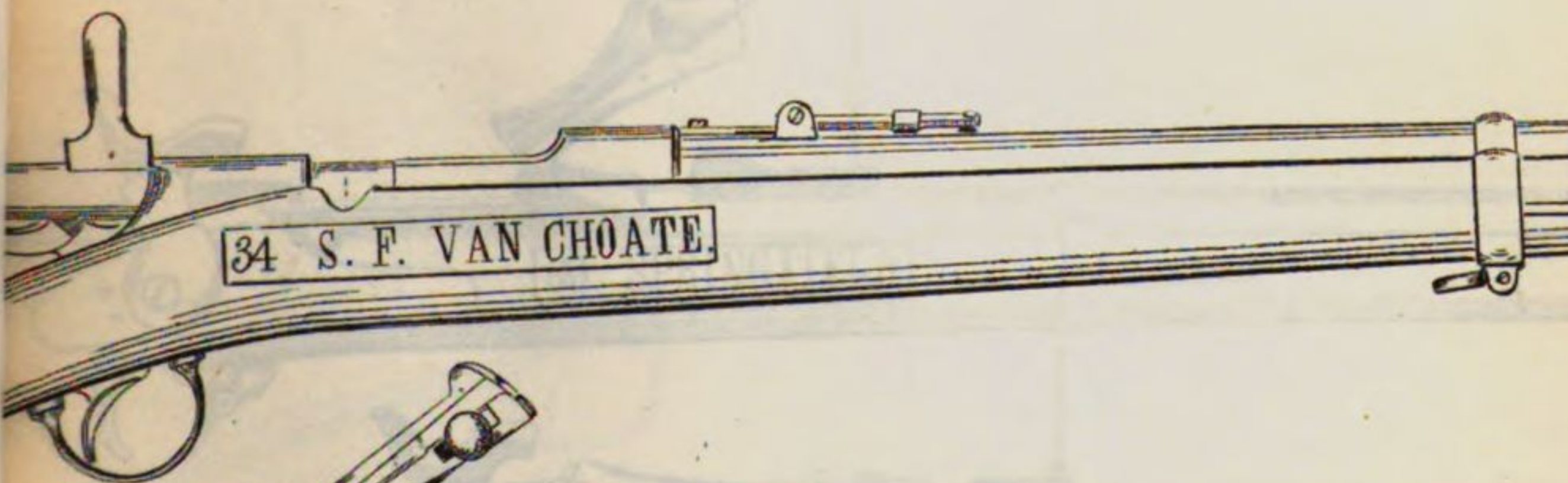
5 SHARPS.



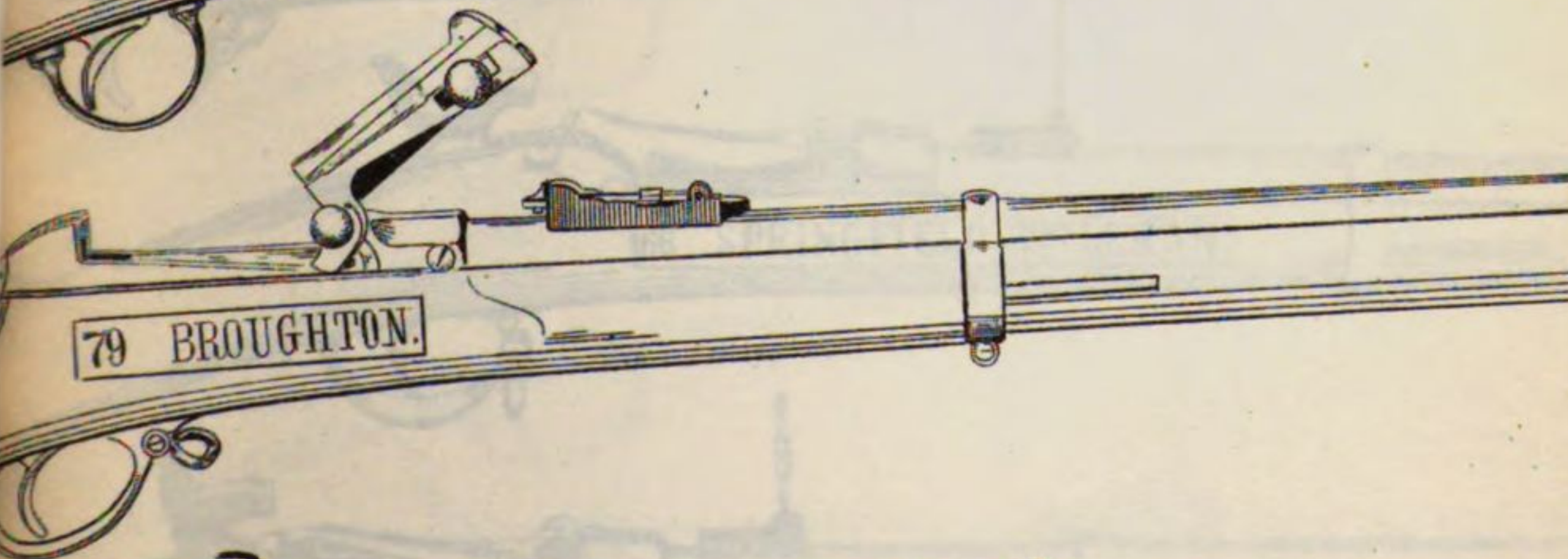
18 BROUGHTON



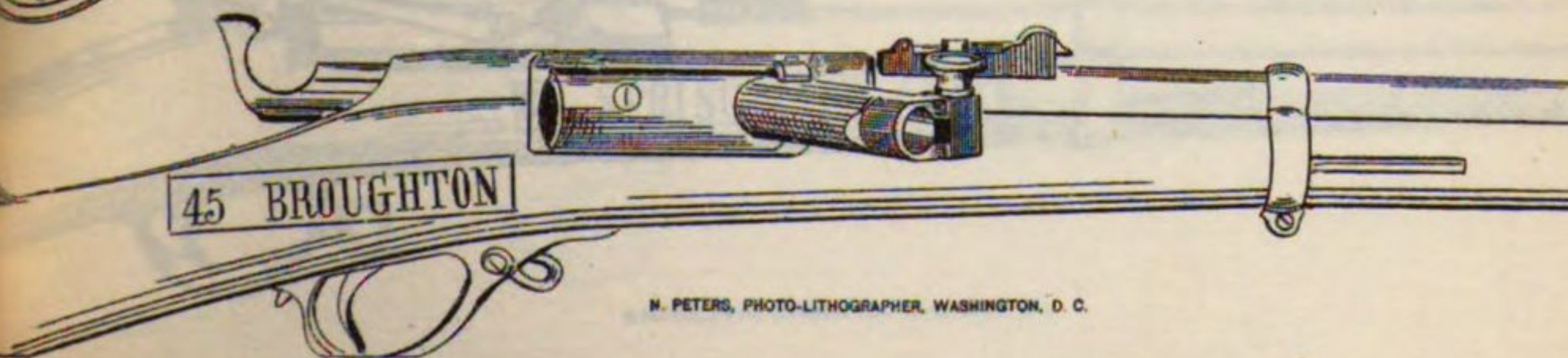
63 PEABODY.



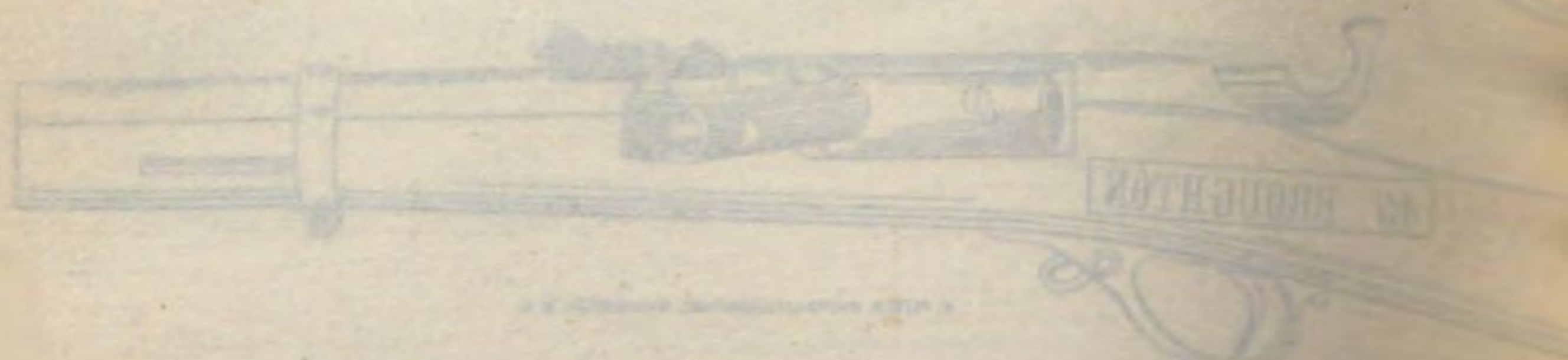
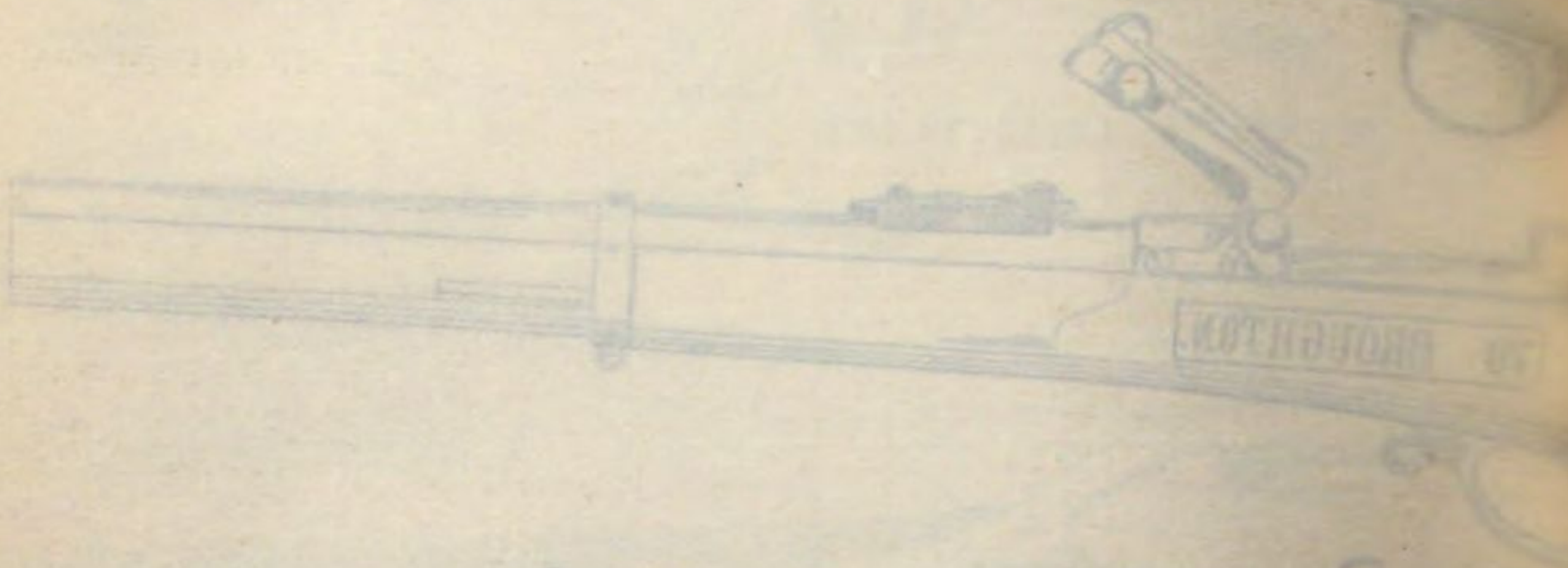
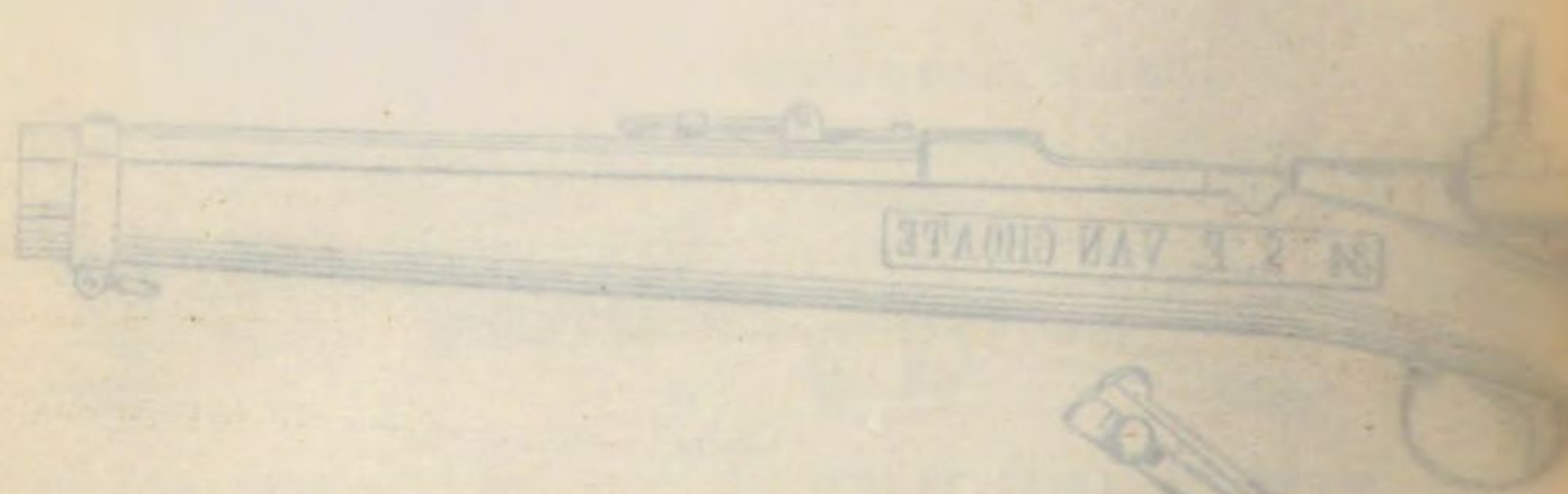
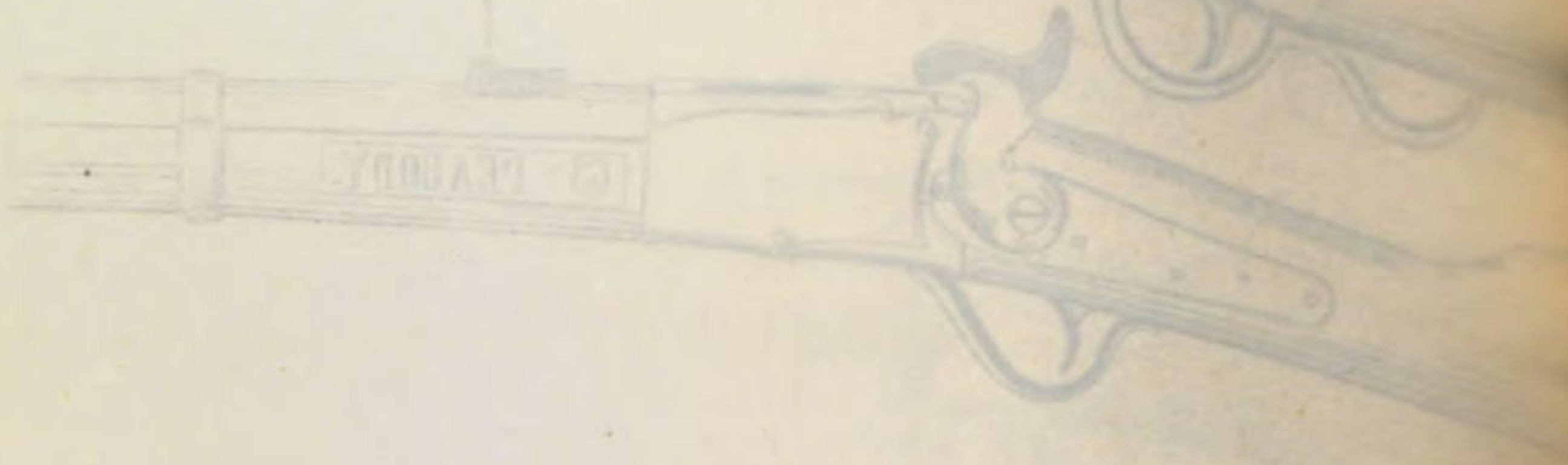
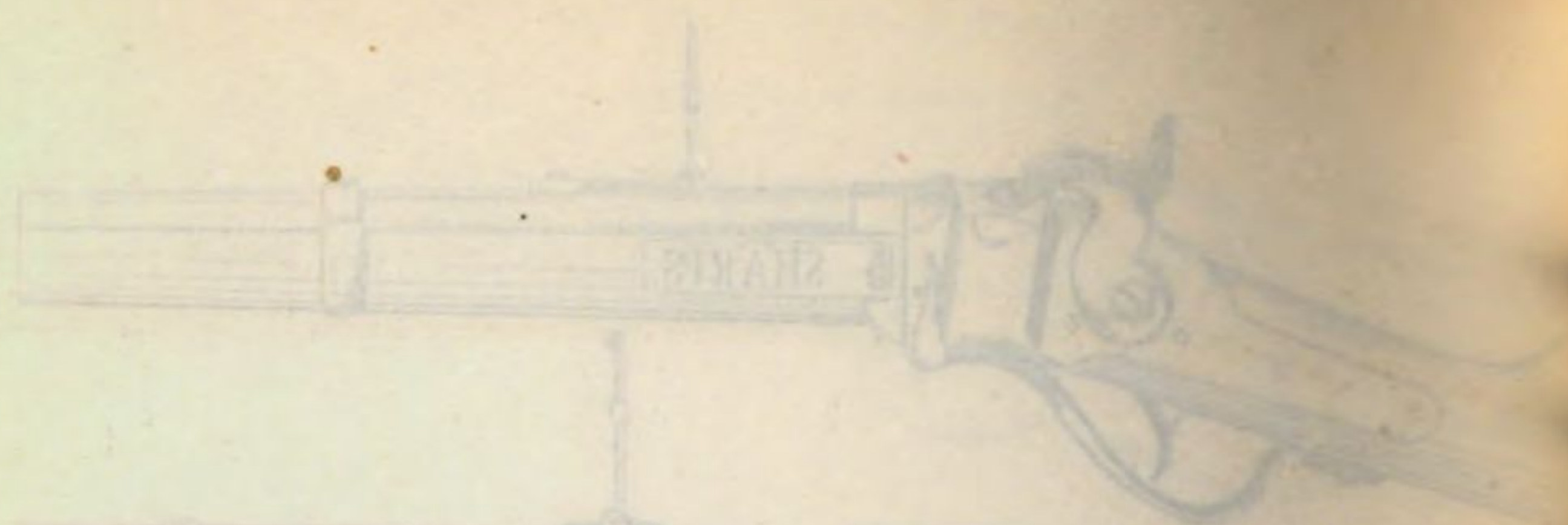
34 S. F. VAN CHOATE.

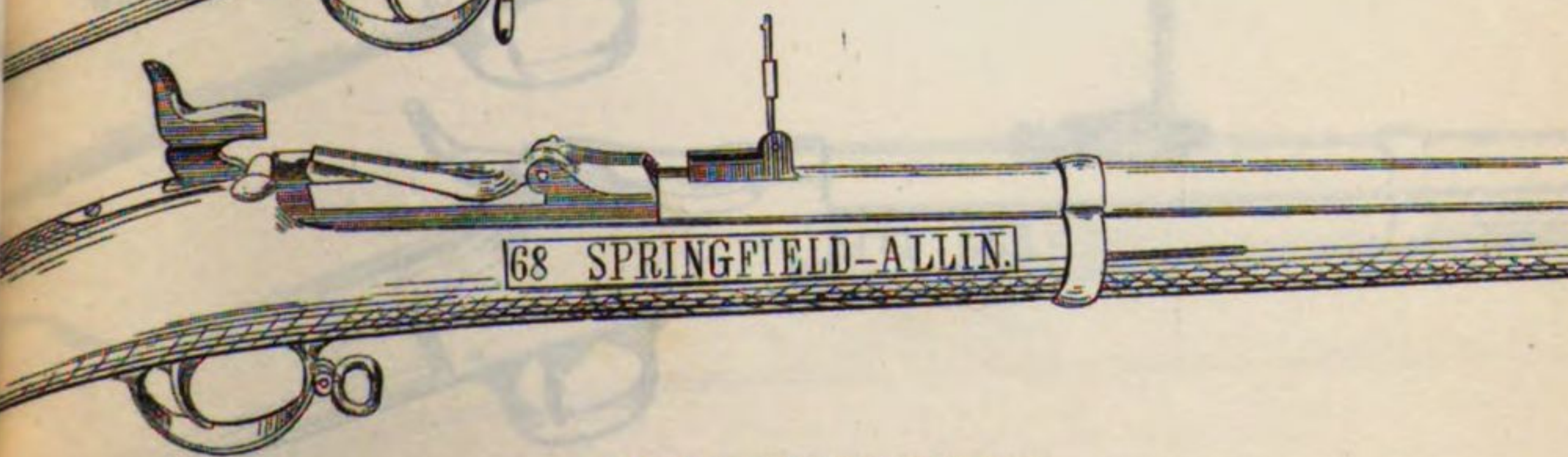
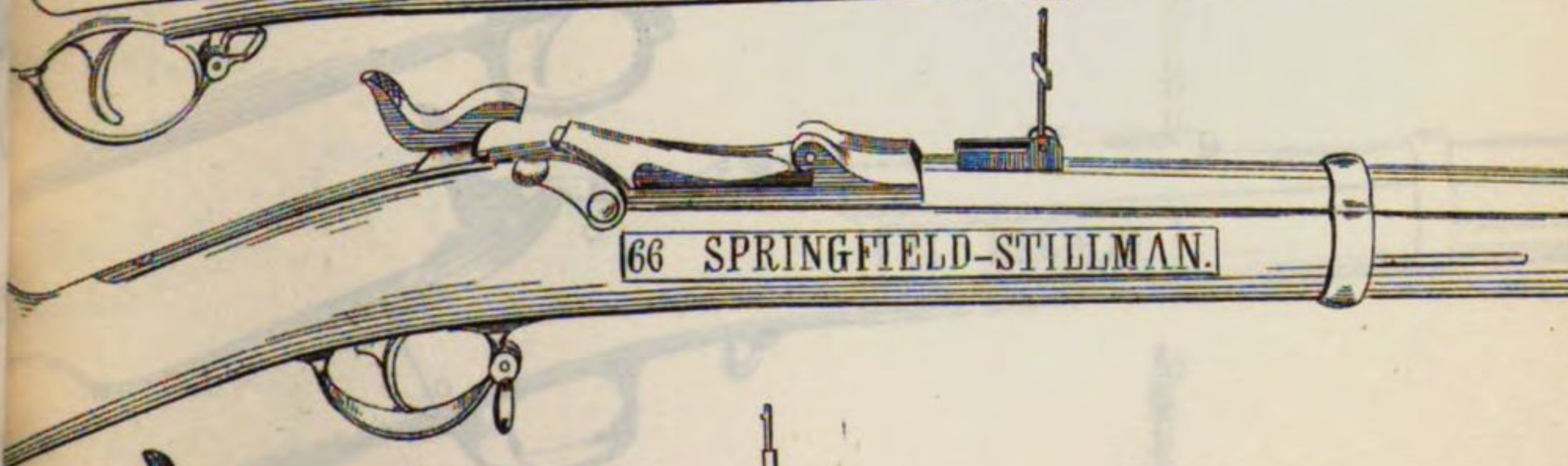
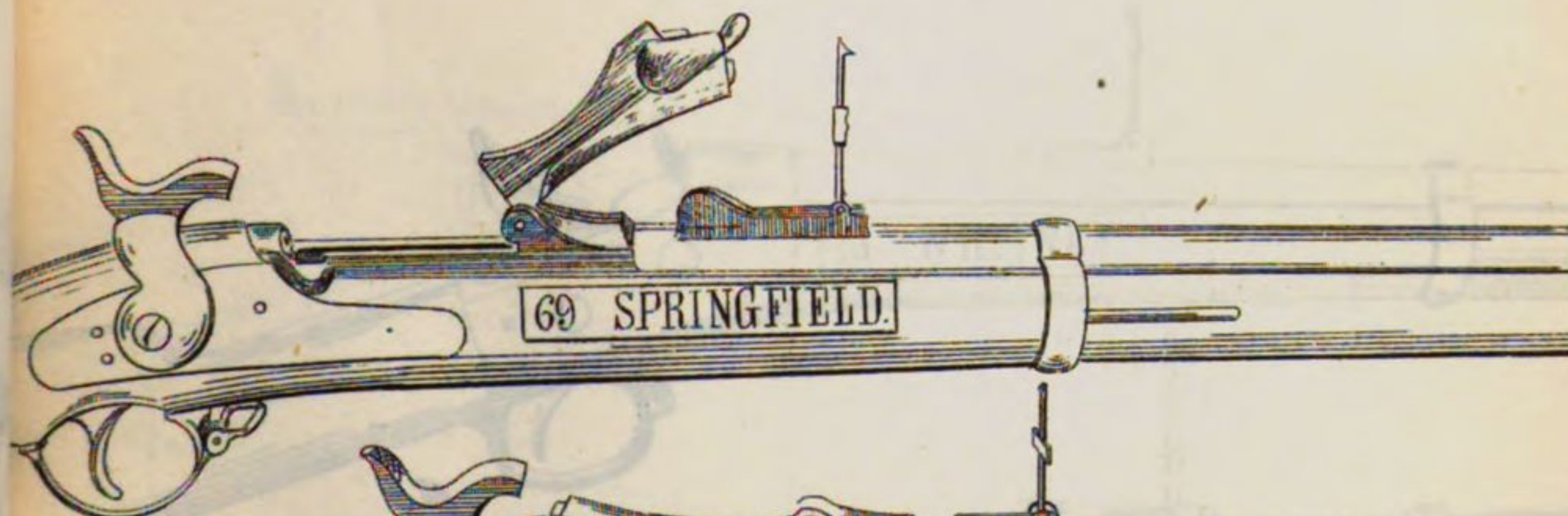
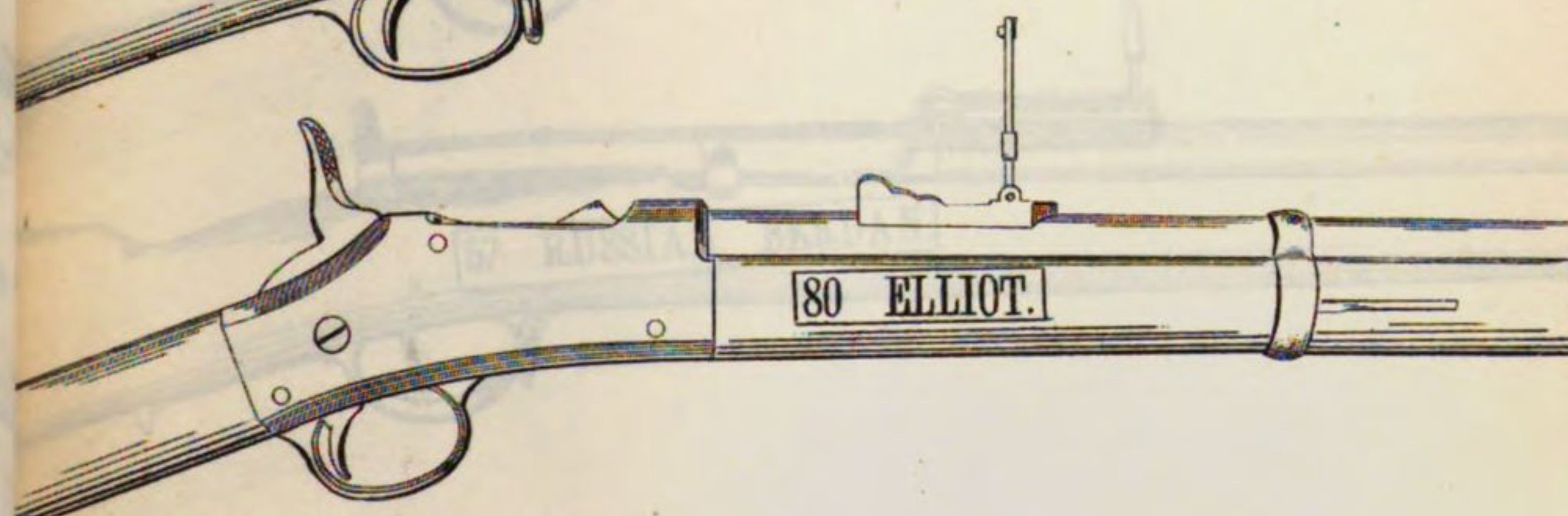
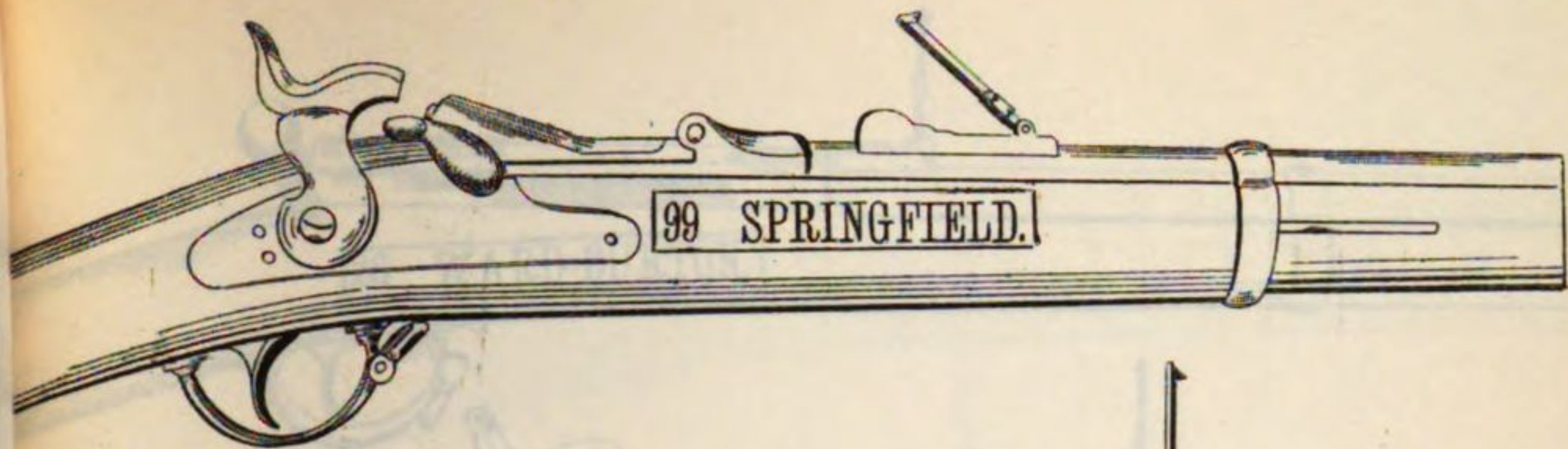


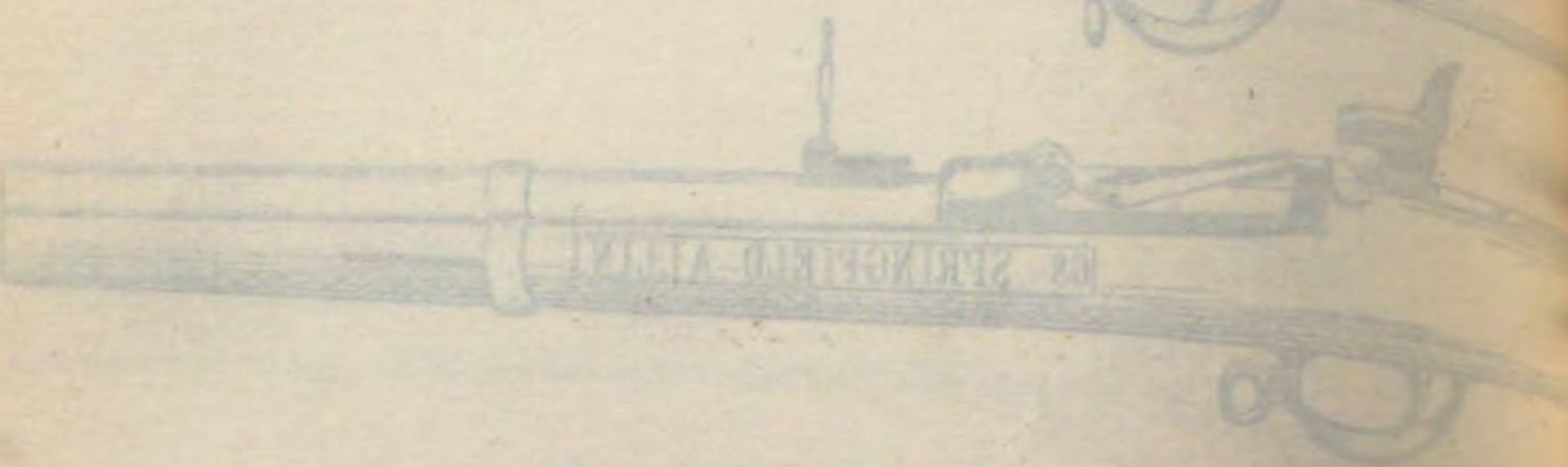
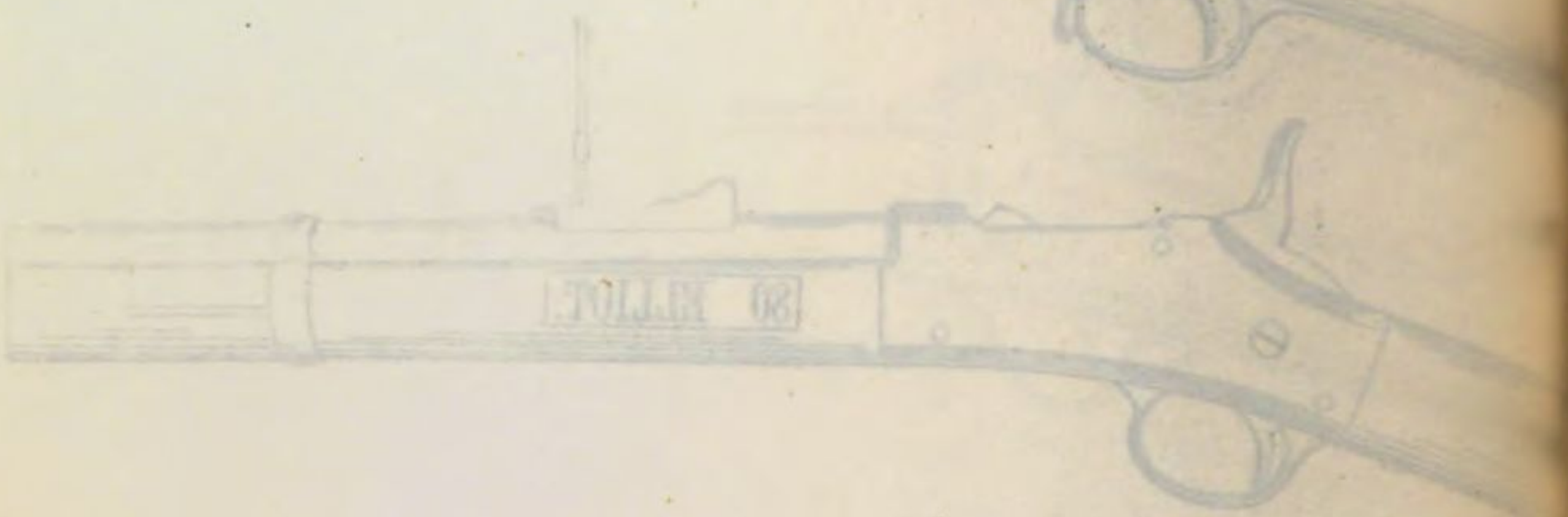
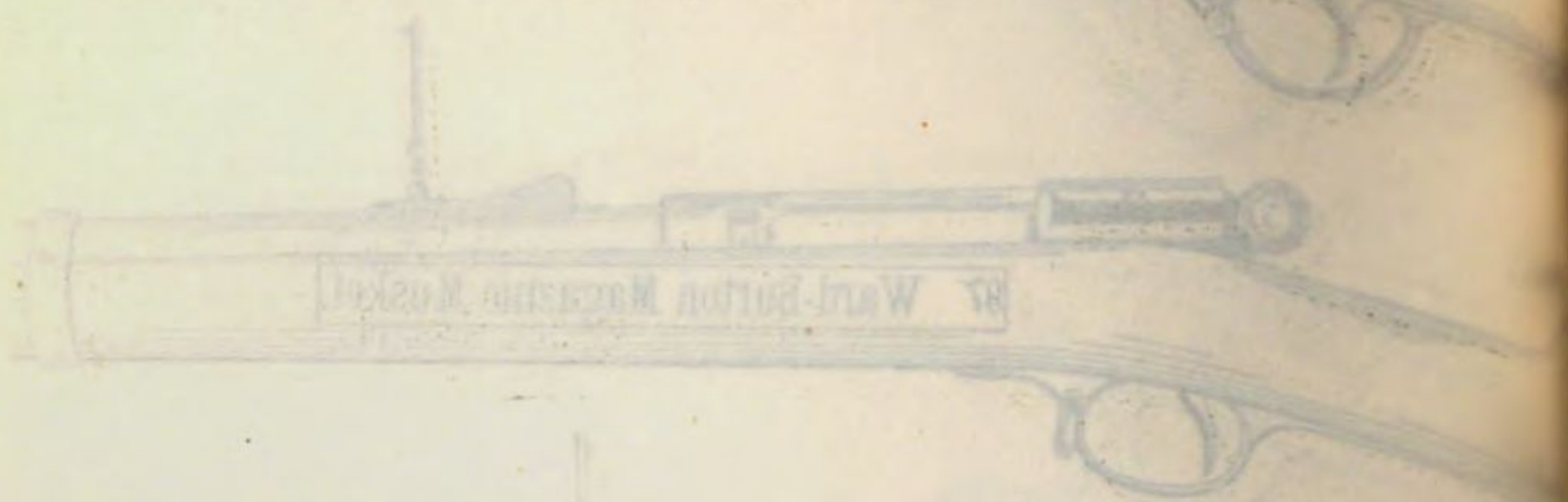
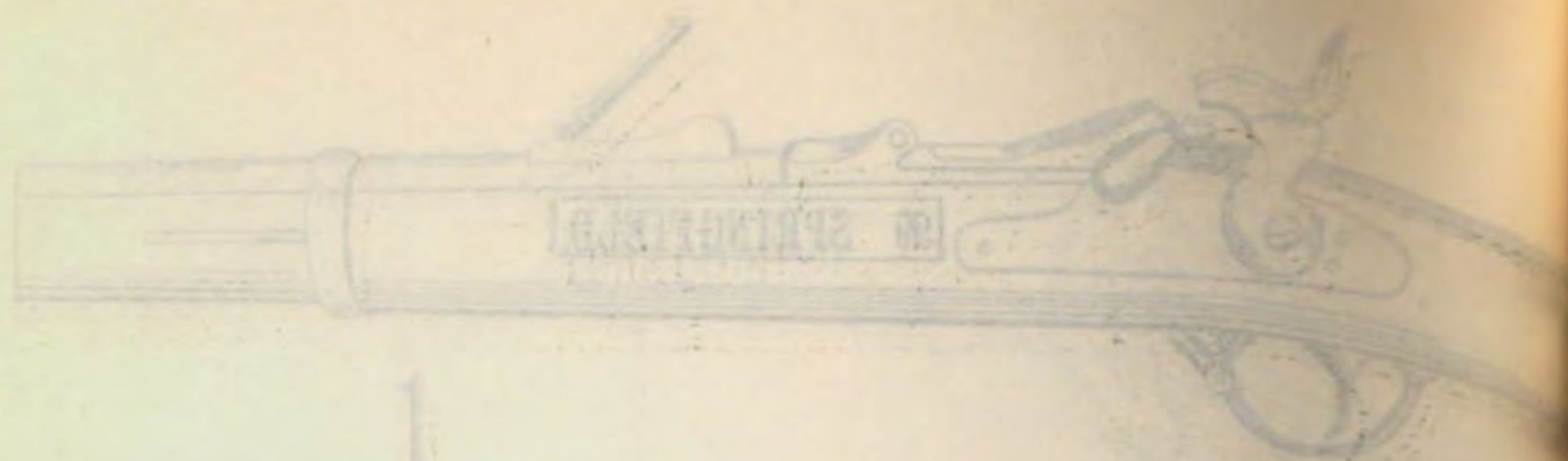
79 BROUGHTON.

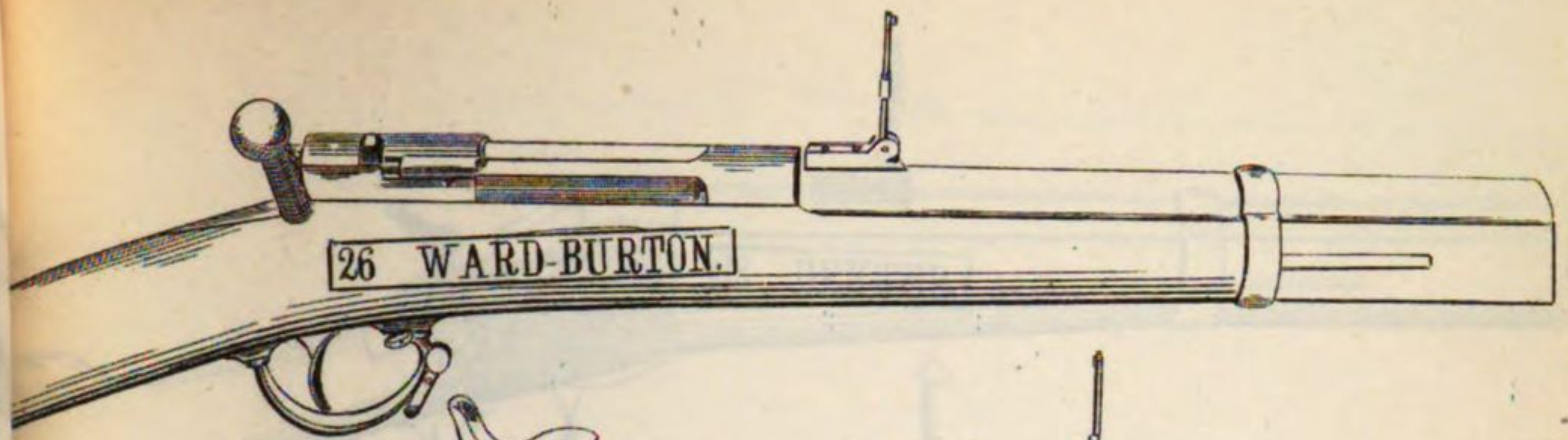


45 BROUGHTON

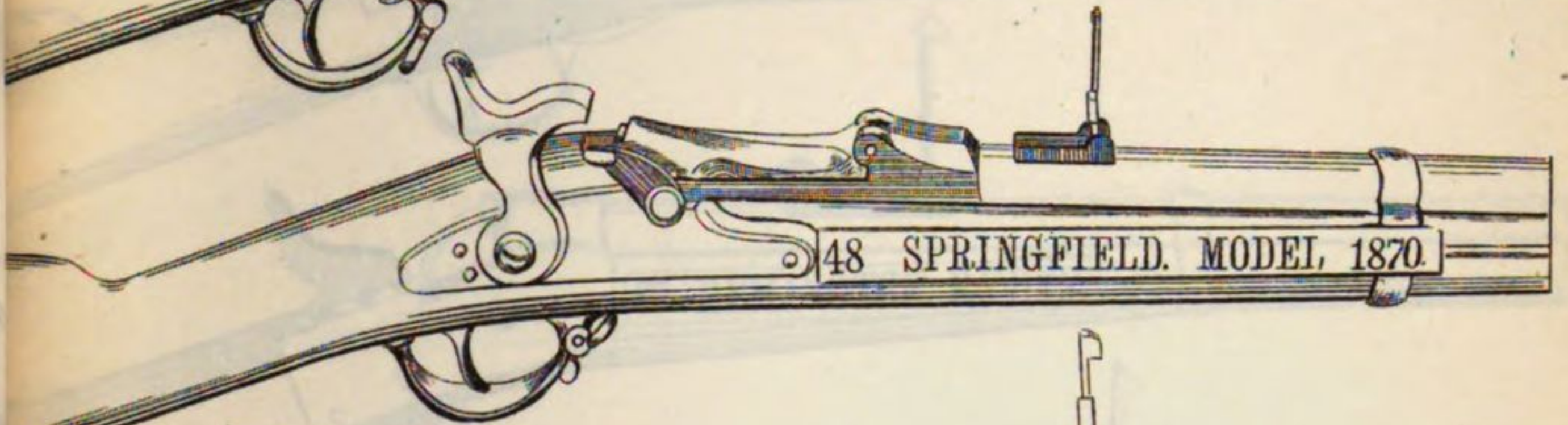




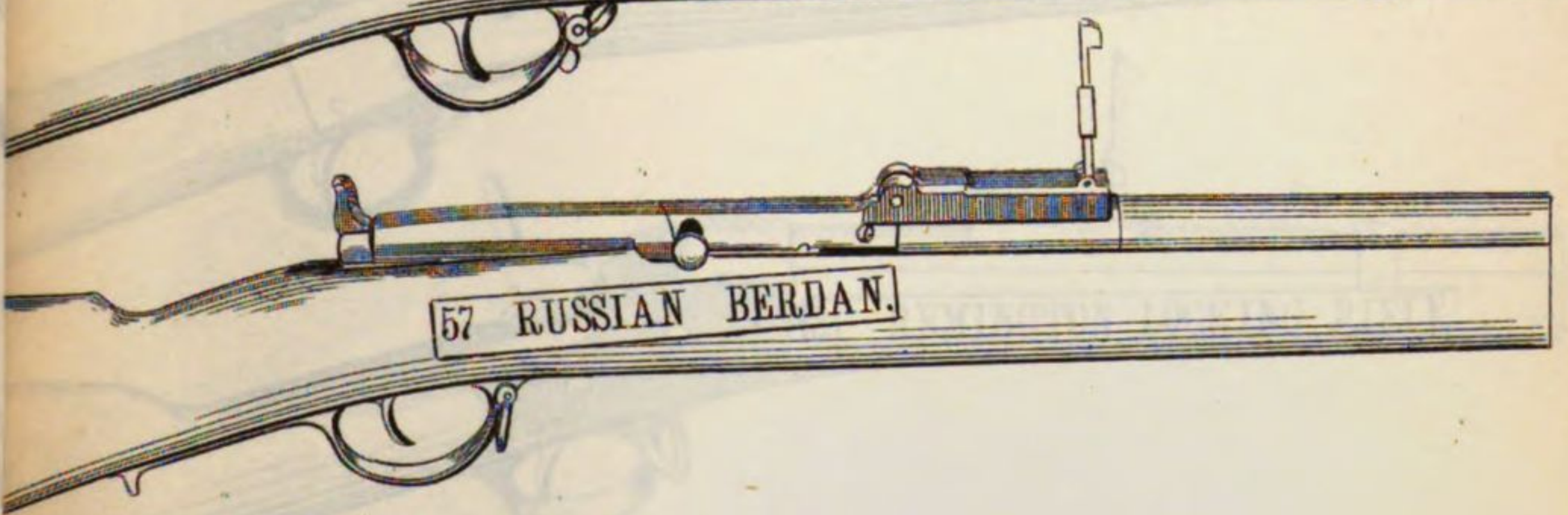




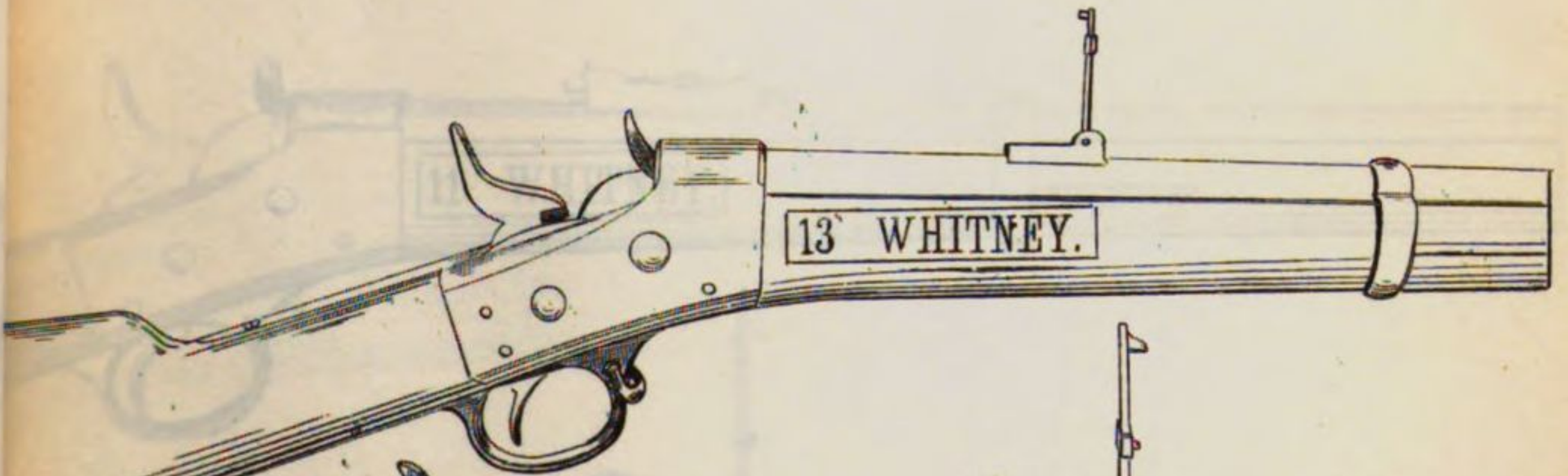
26 WARD-BURTON.



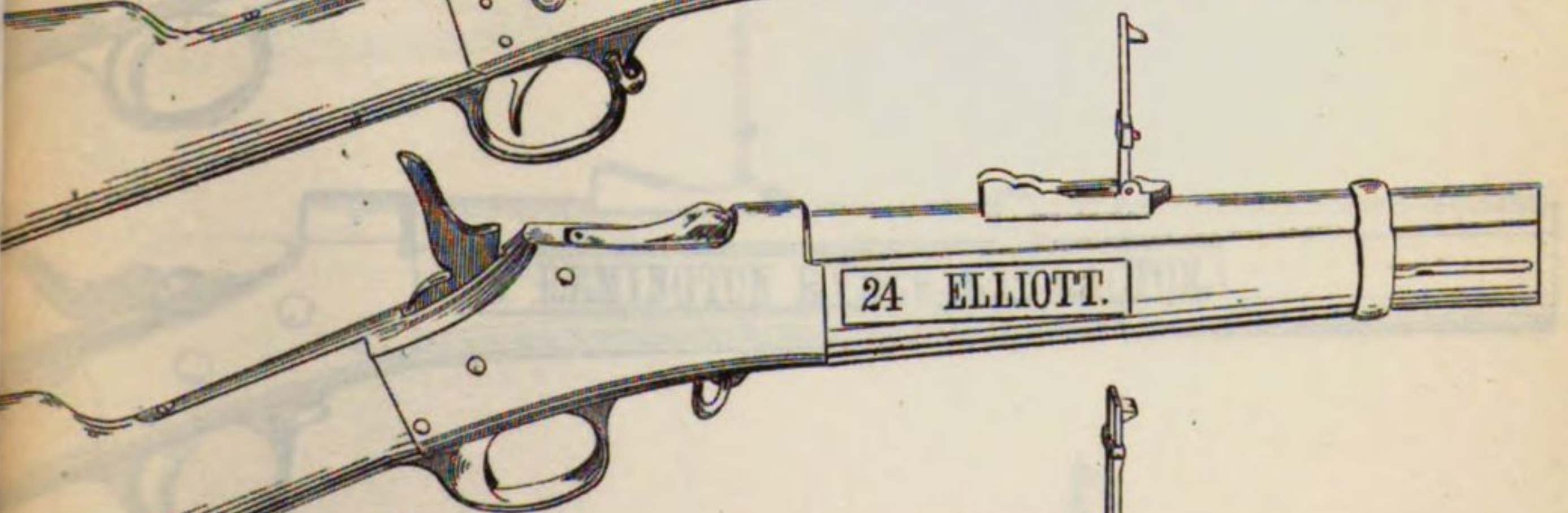
48 SPRINGFIELD. MODEL, 1870.



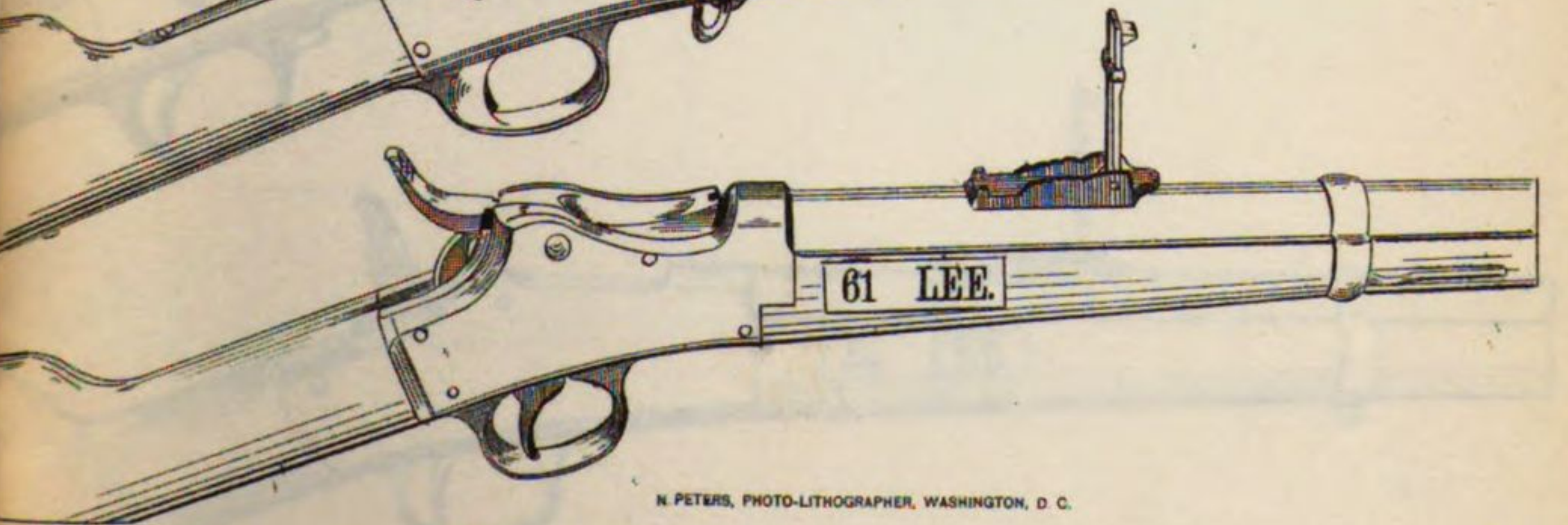
57 RUSSIAN BERDAN.



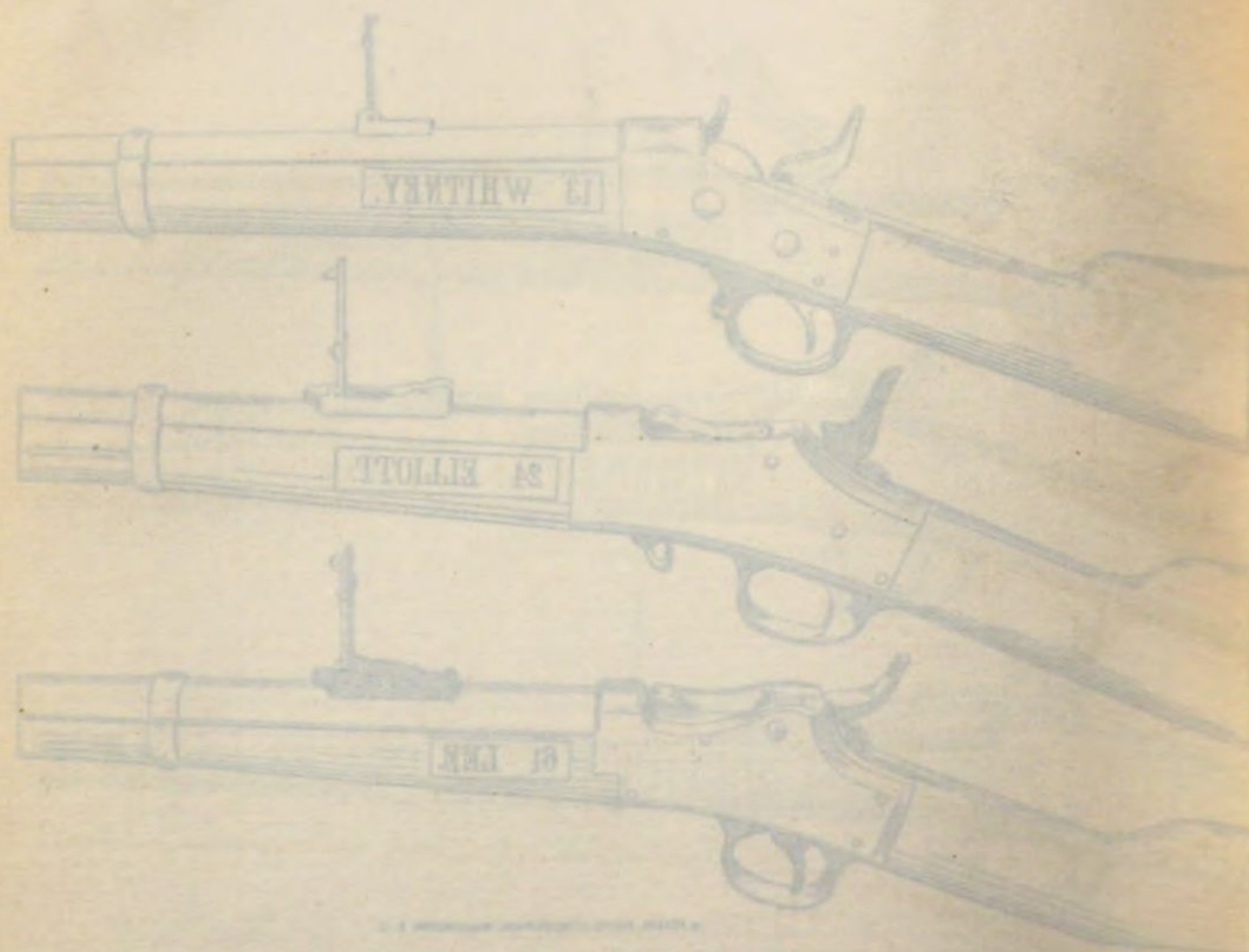
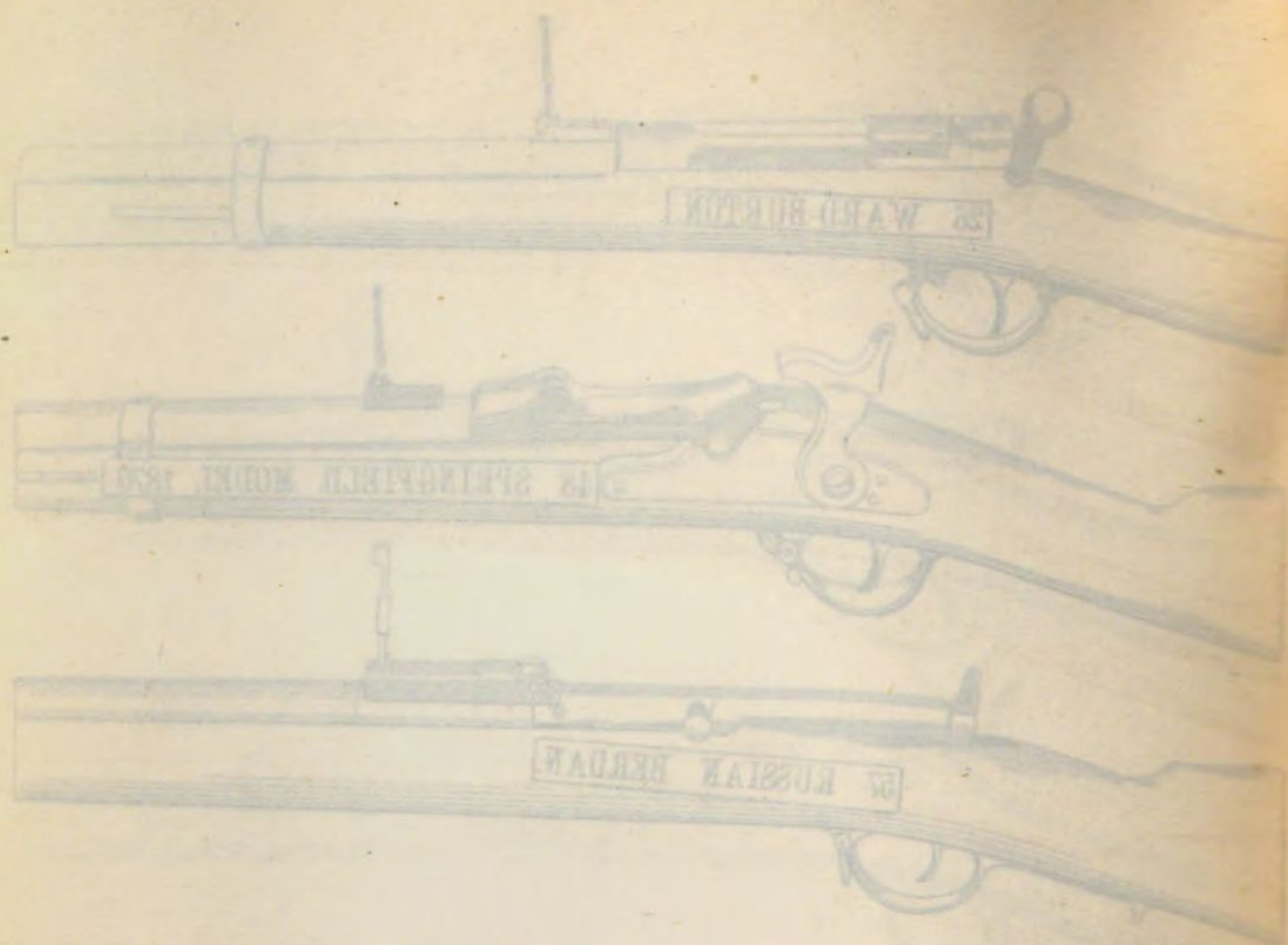
13 WHITNEY.

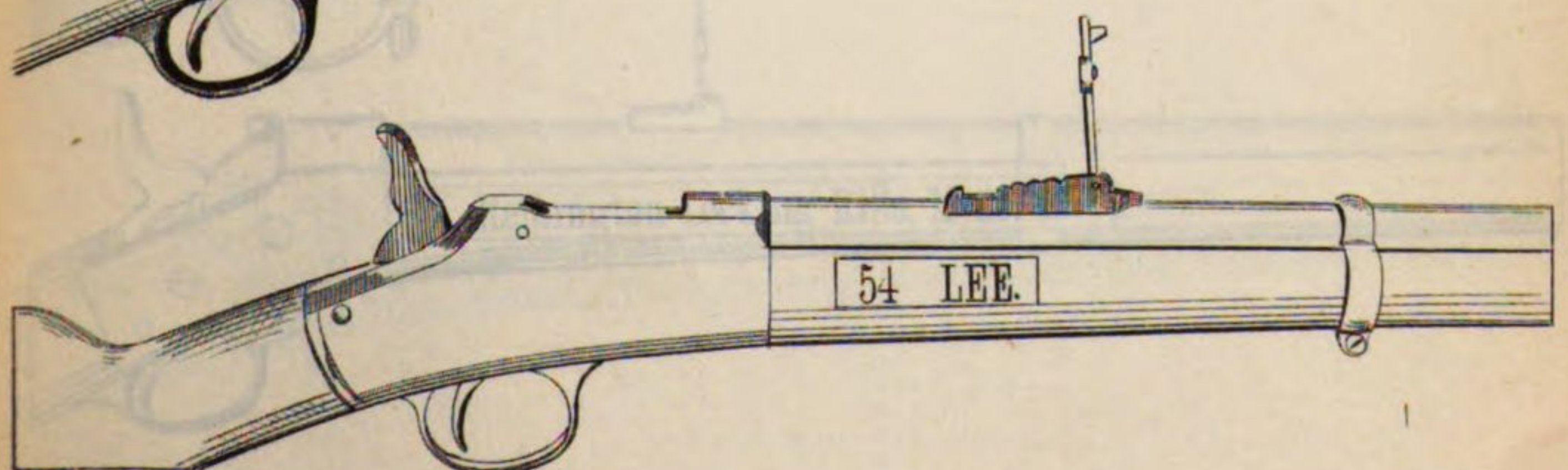
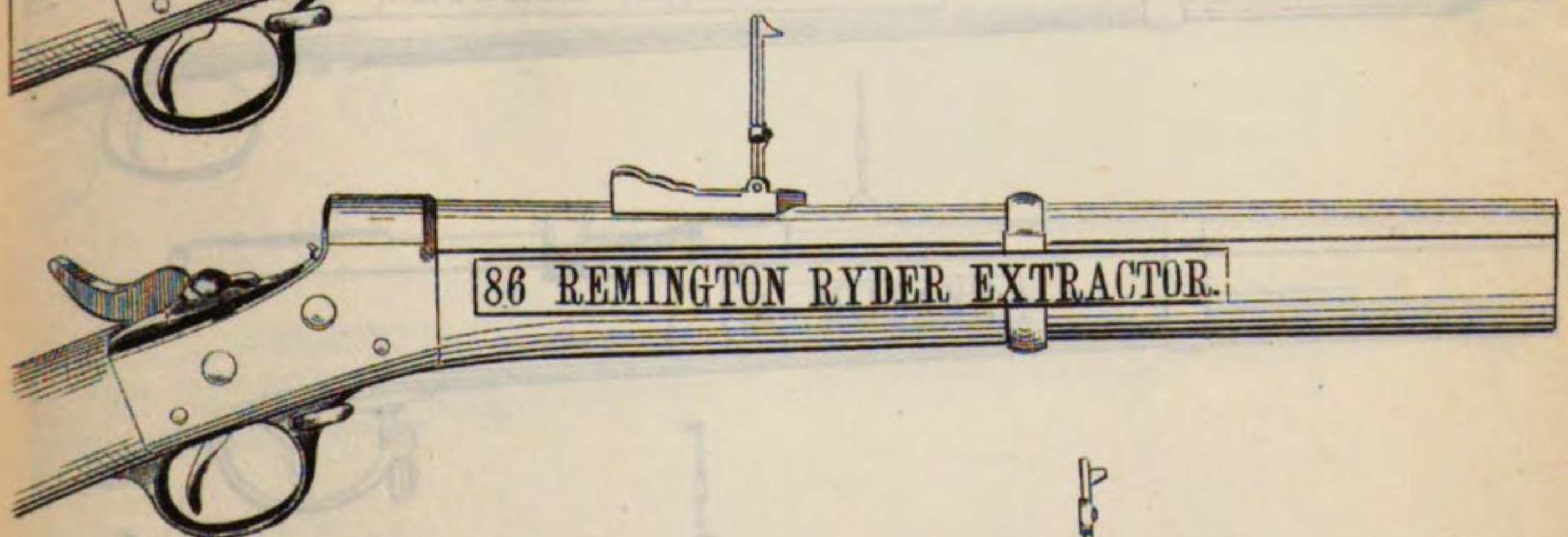
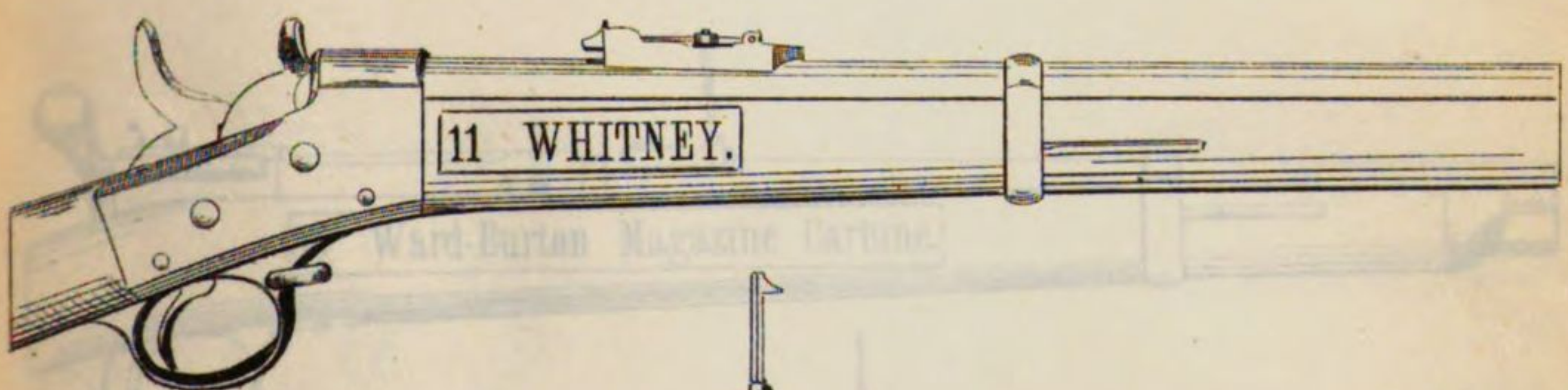
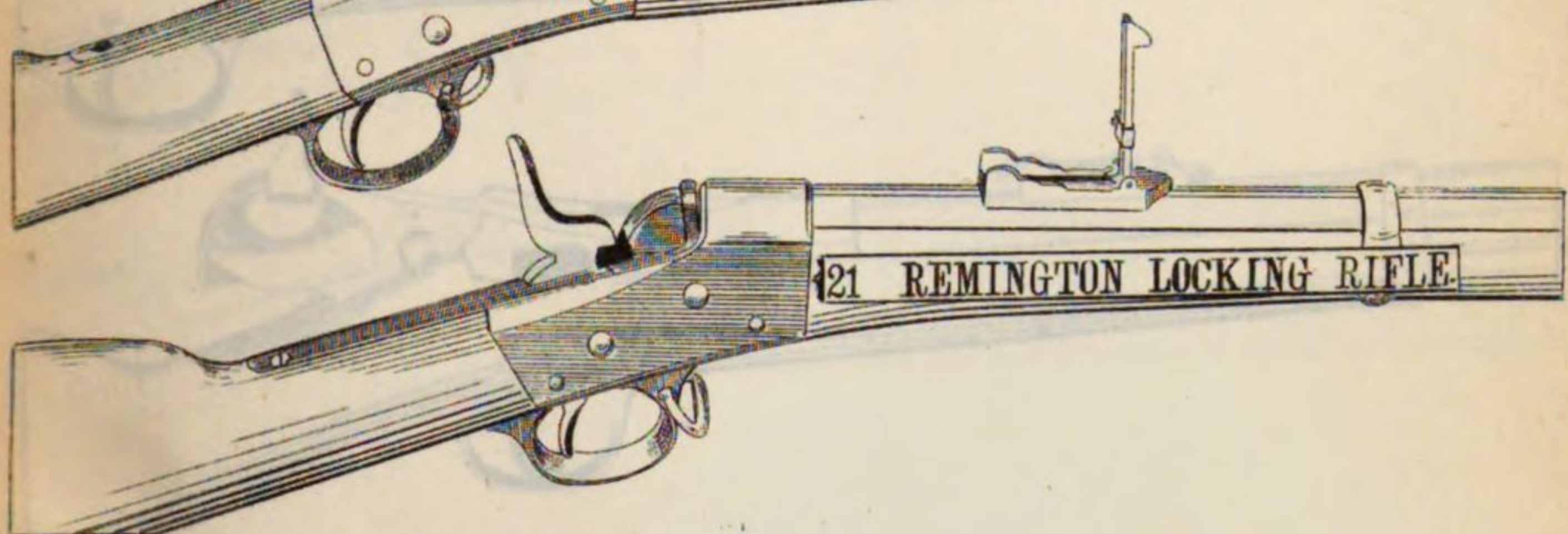
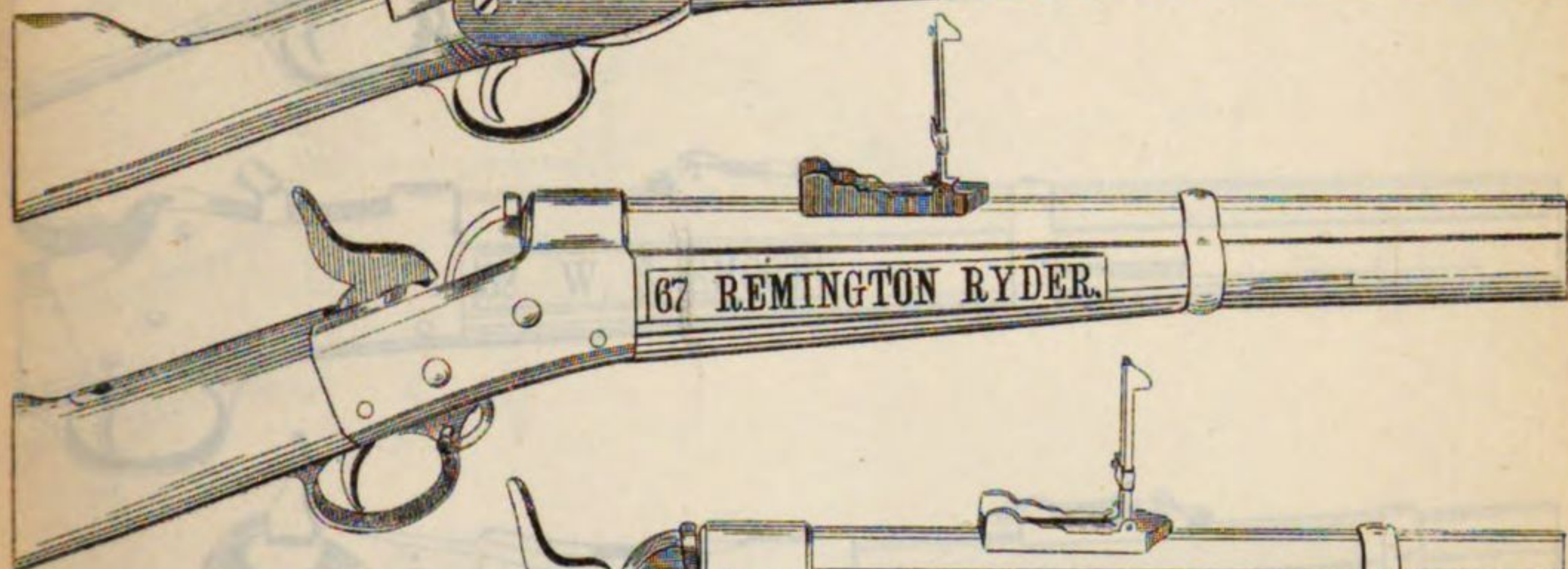
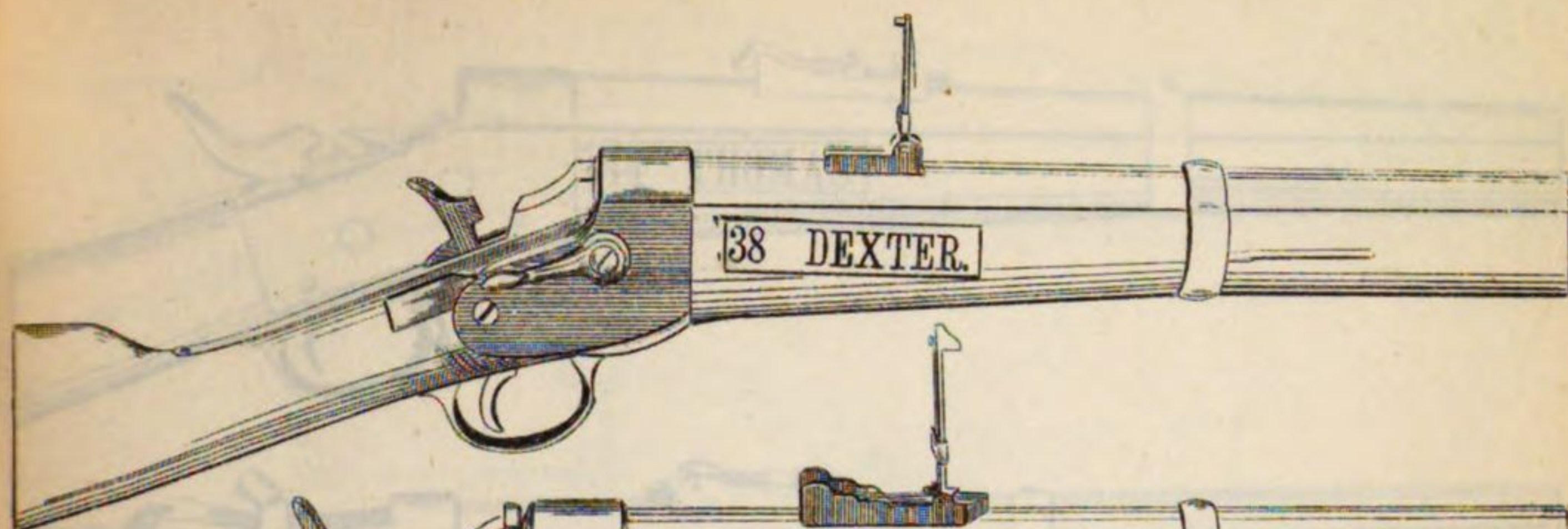


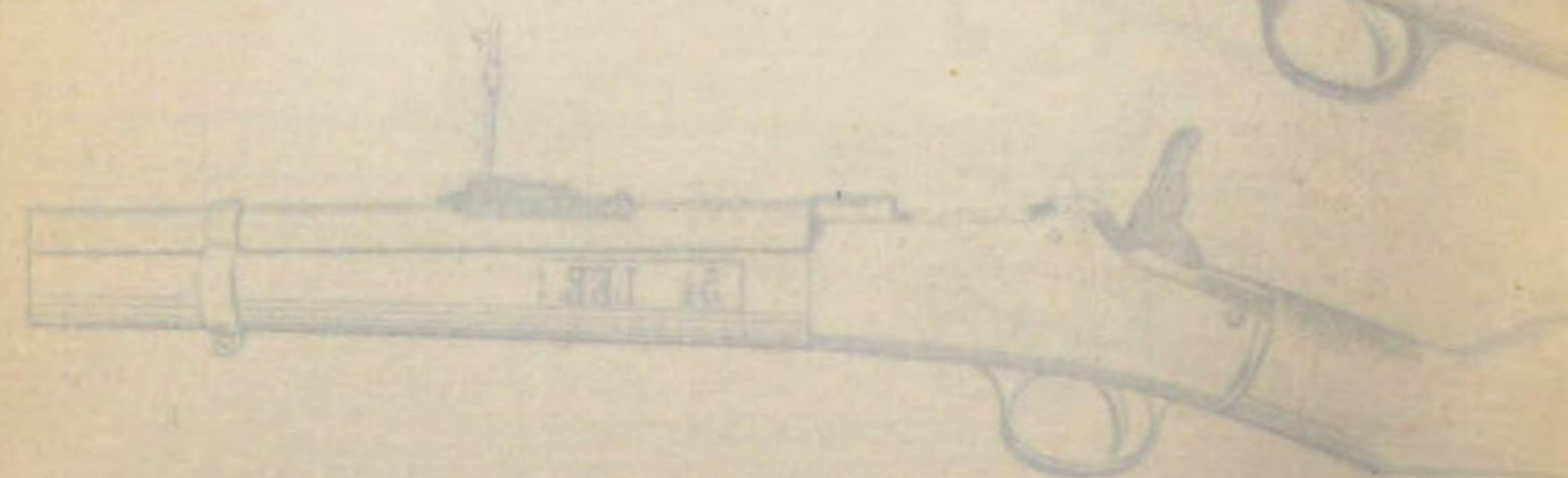
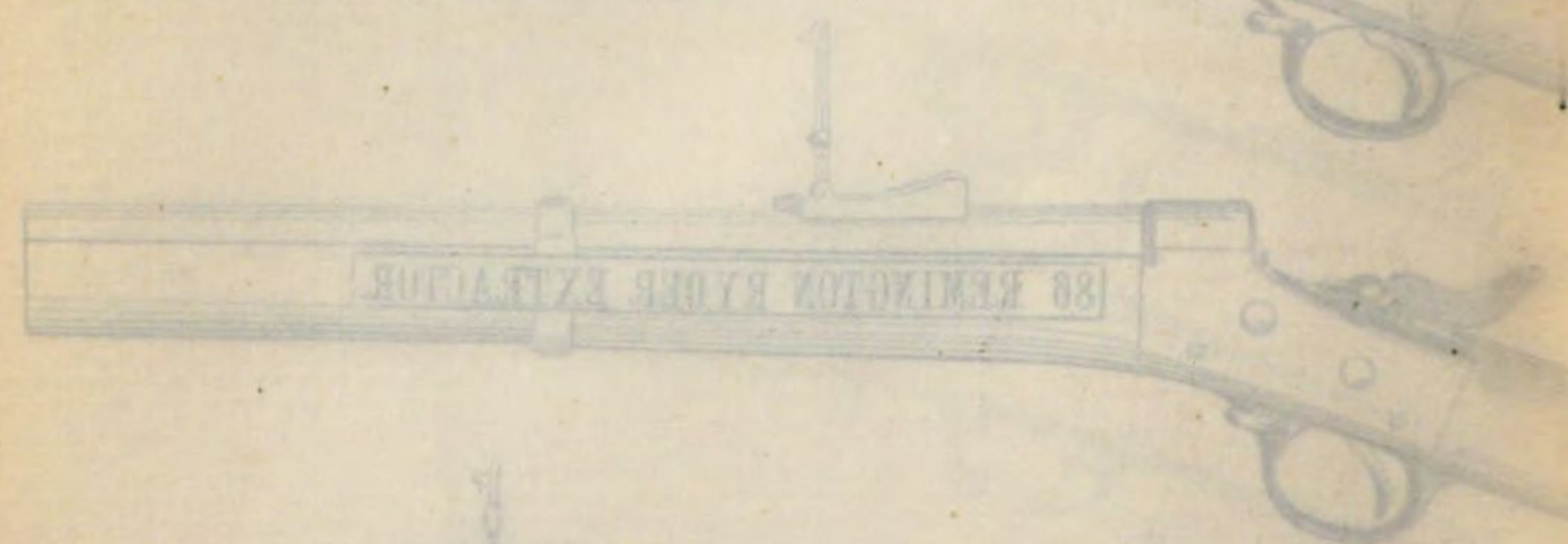
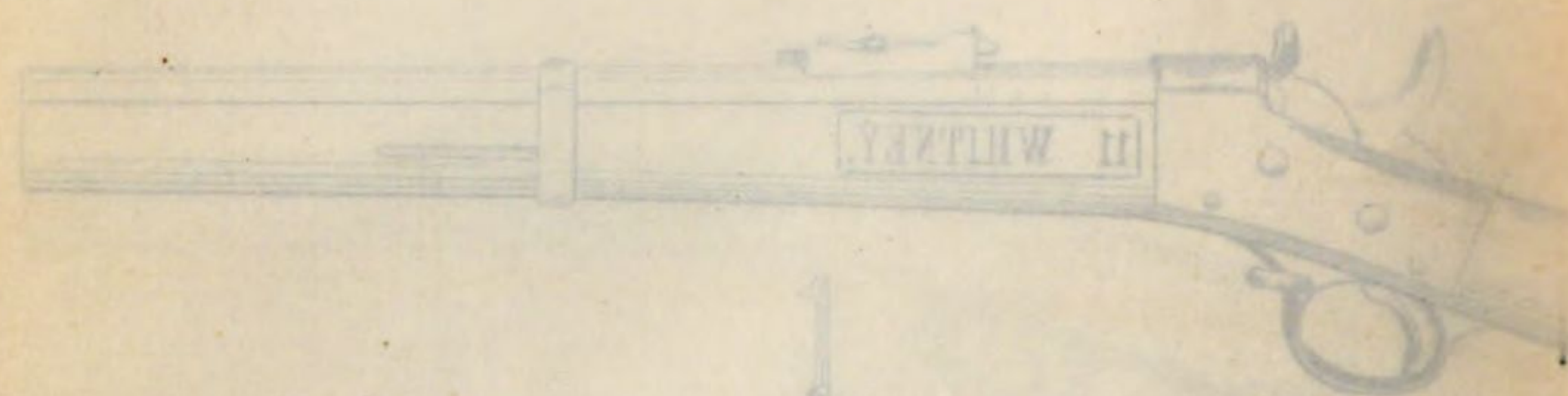
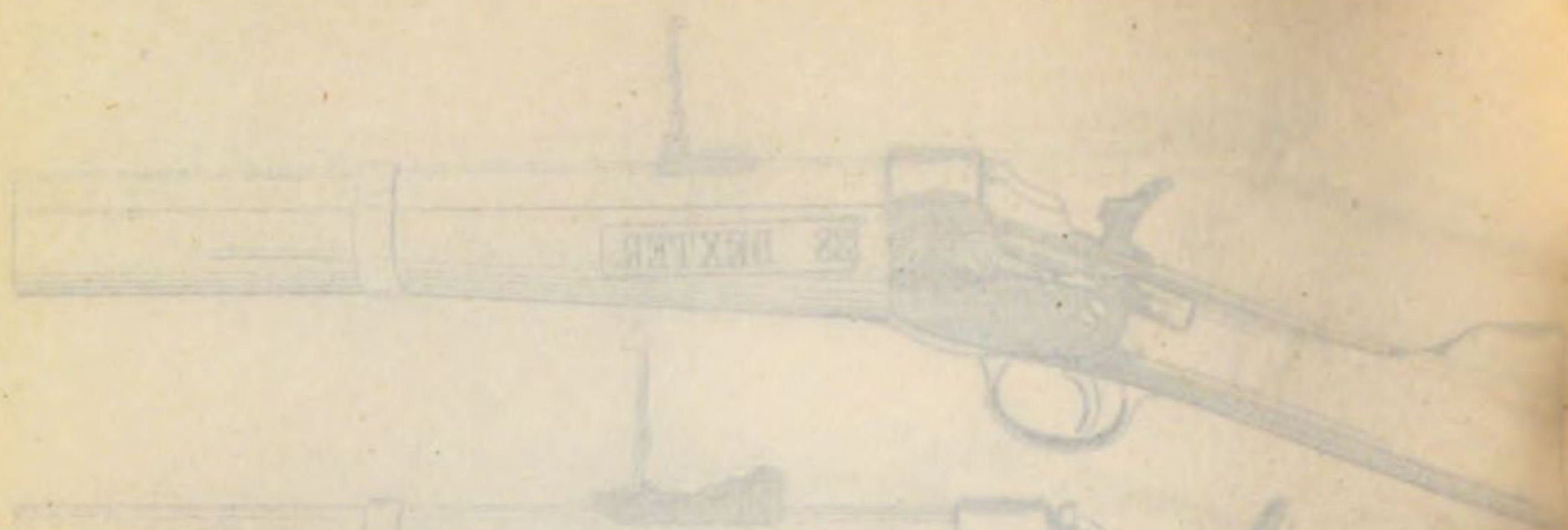
24 ELLIOTT.

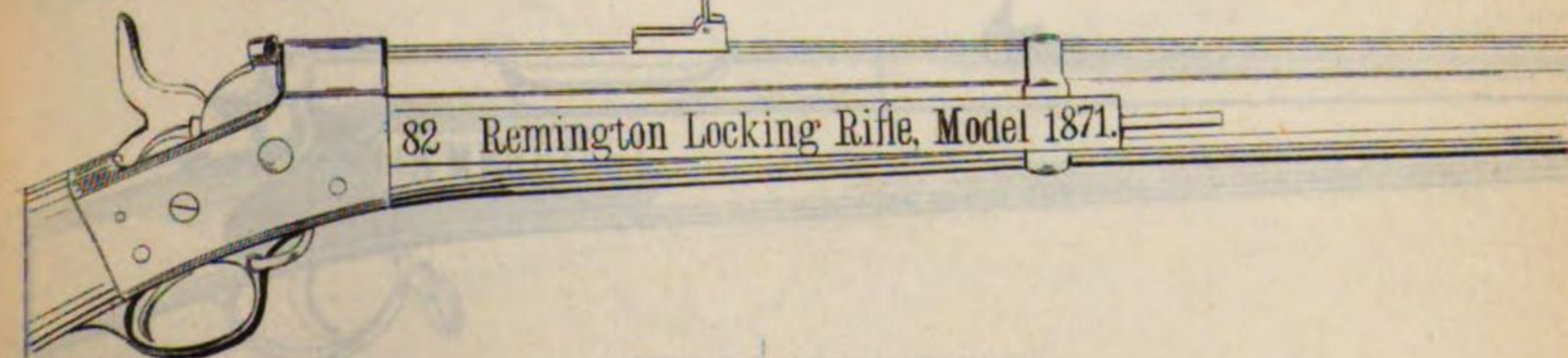
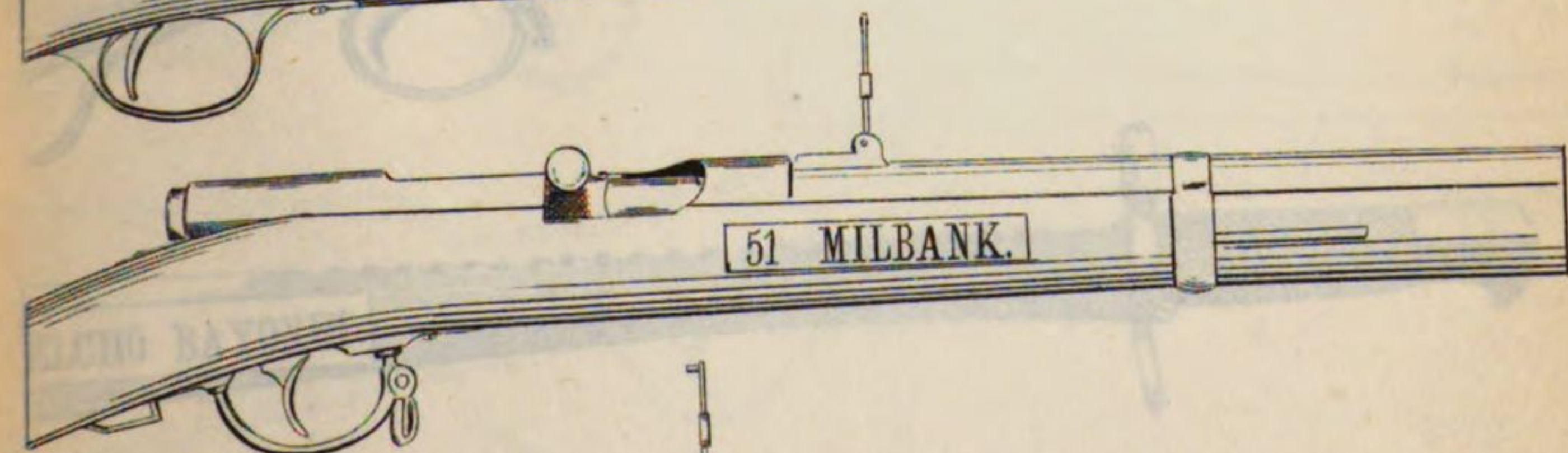
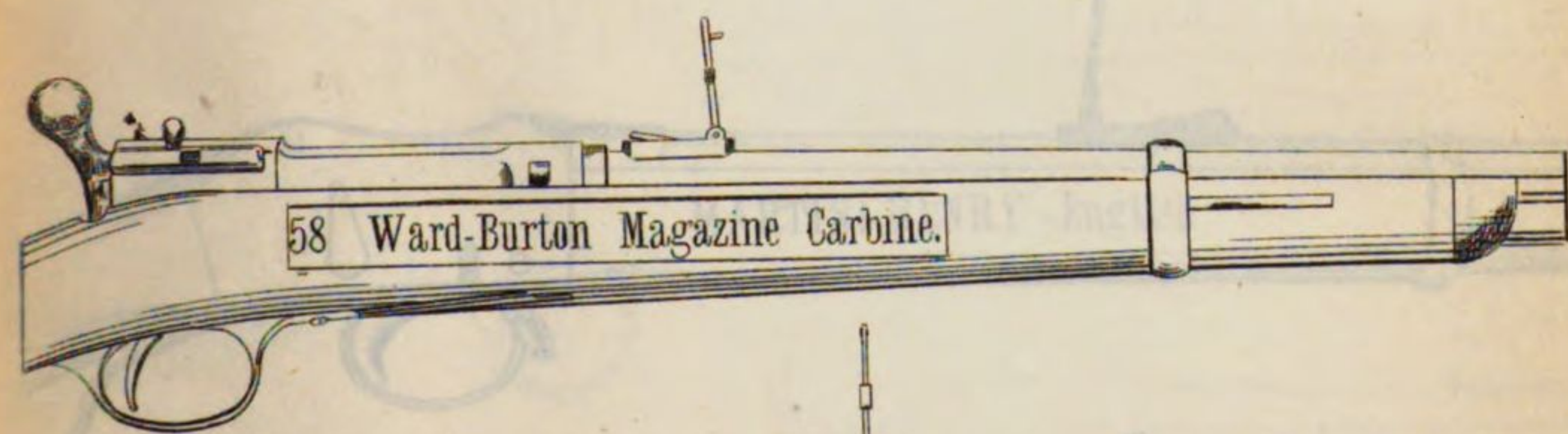
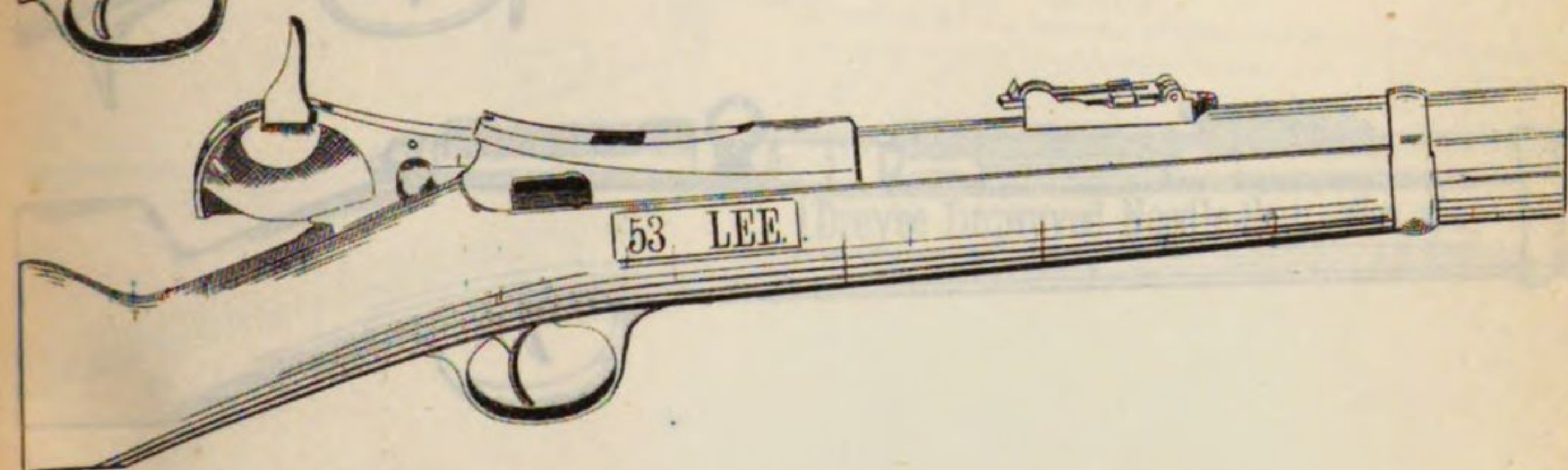
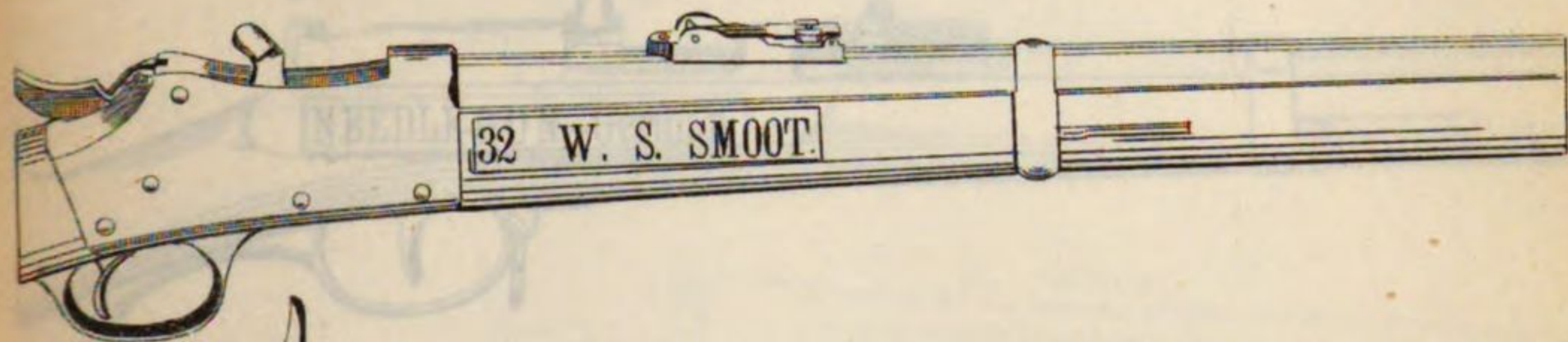
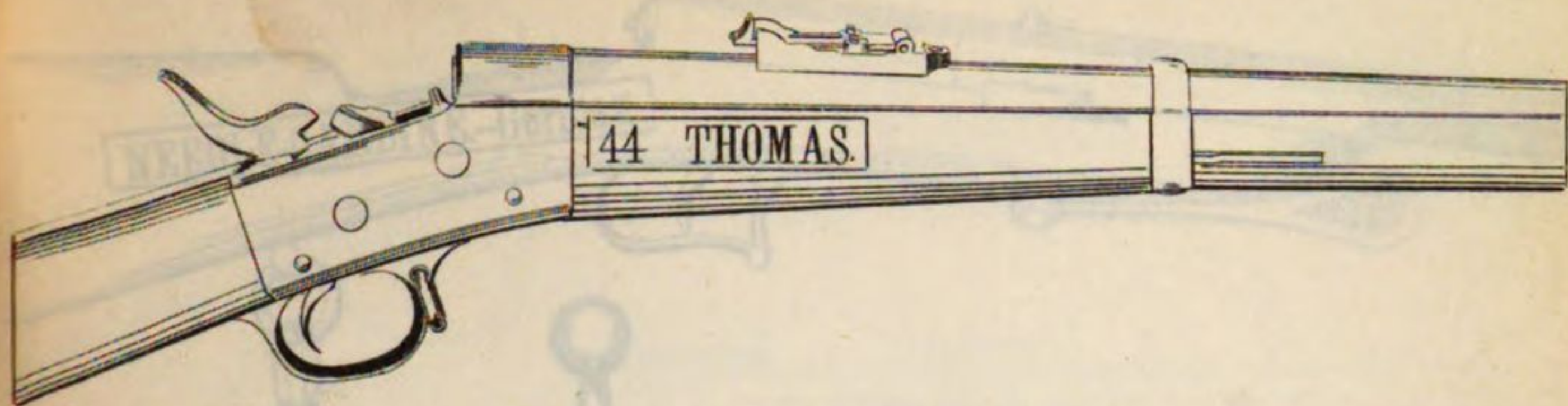


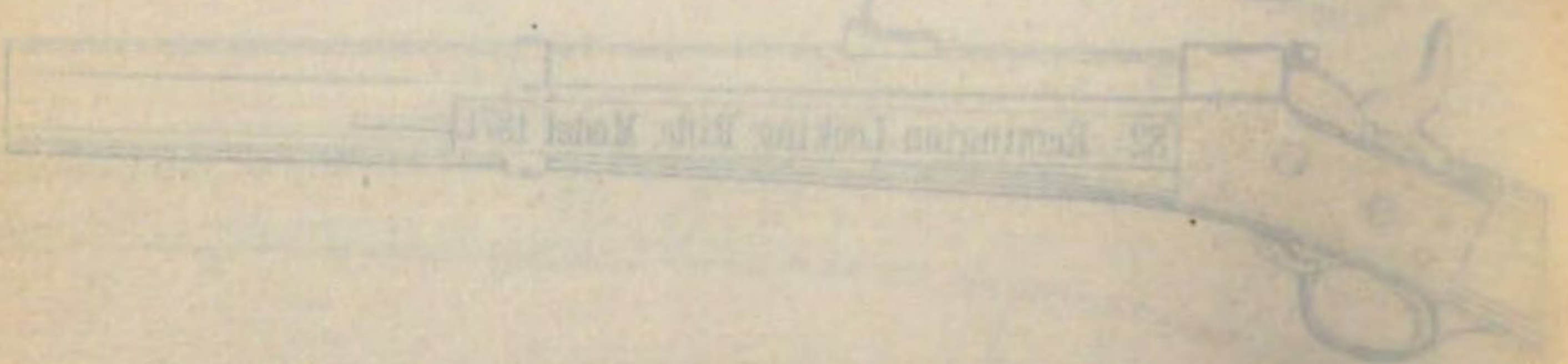
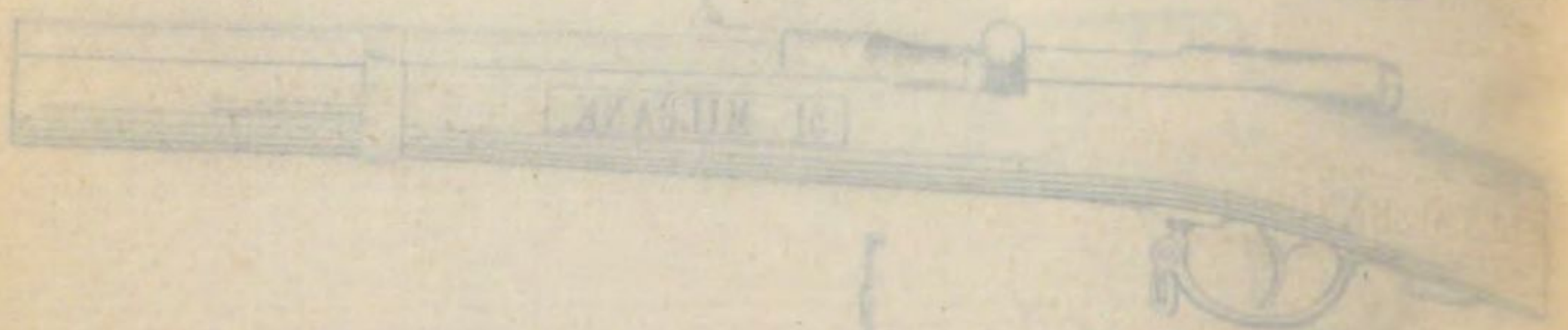
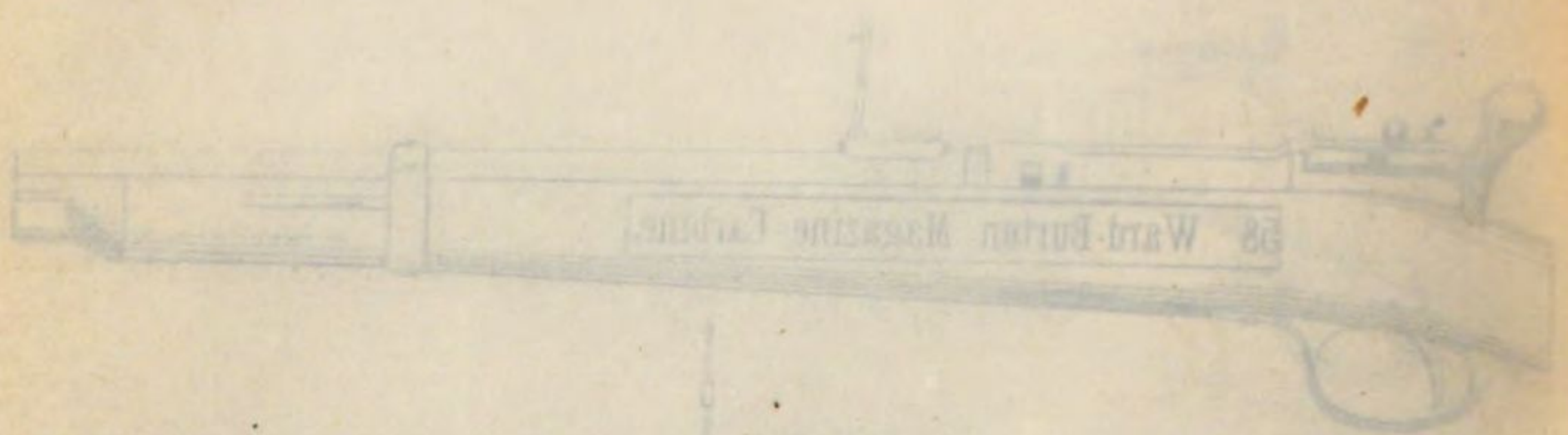
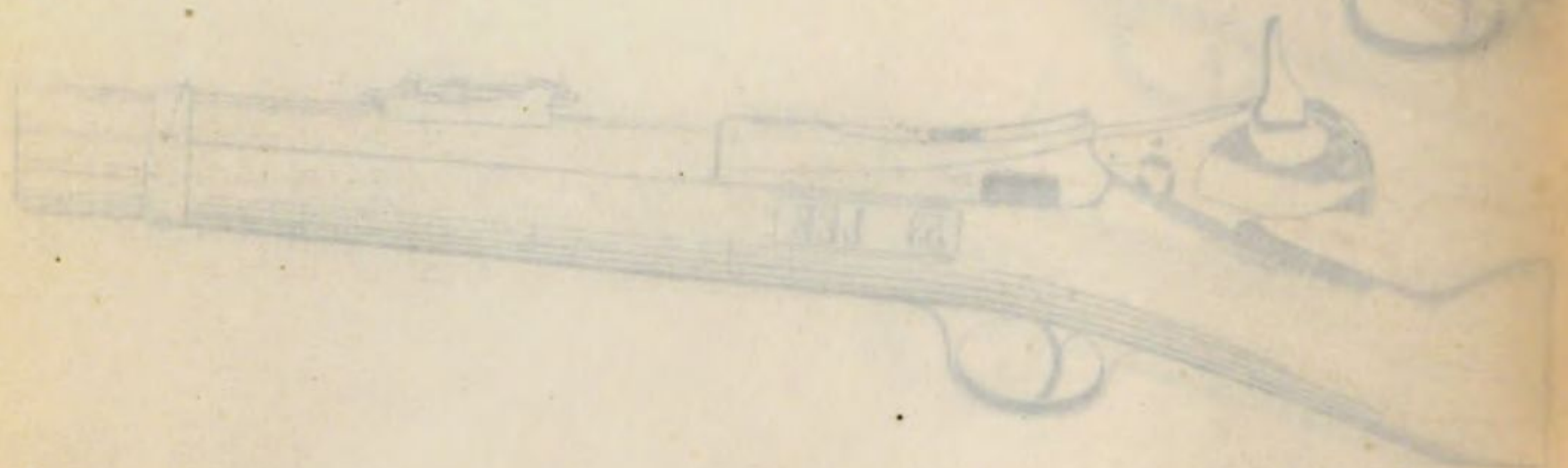
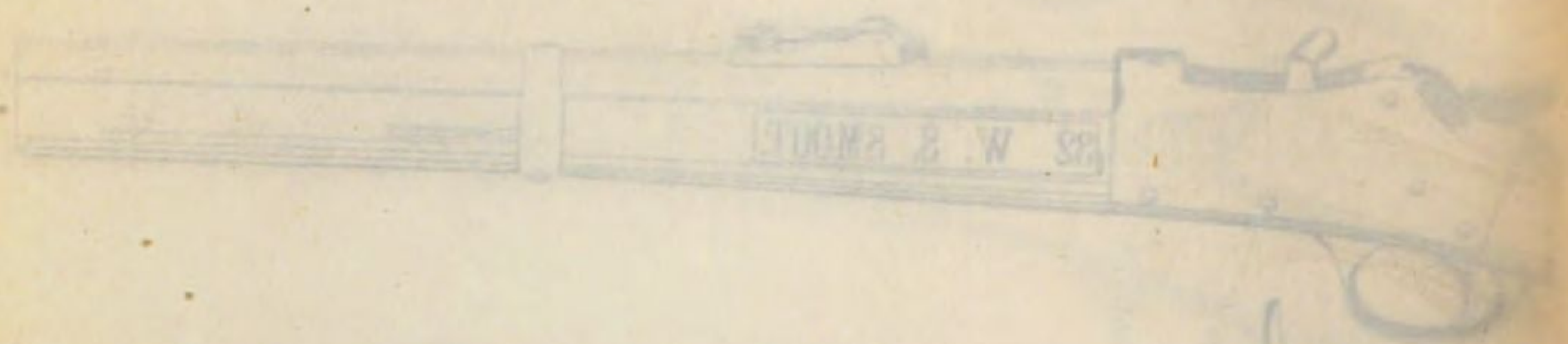
61 LEE.

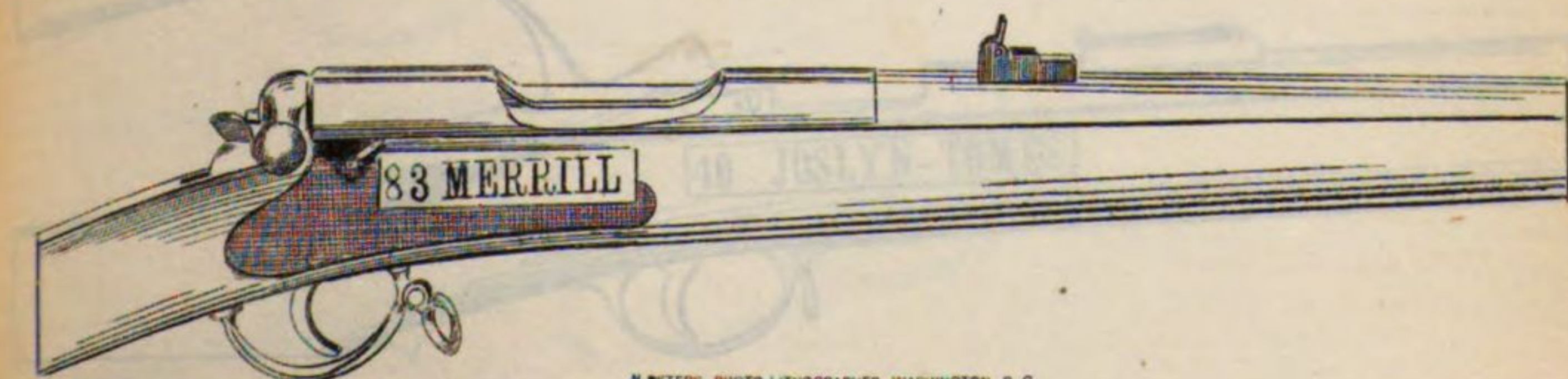
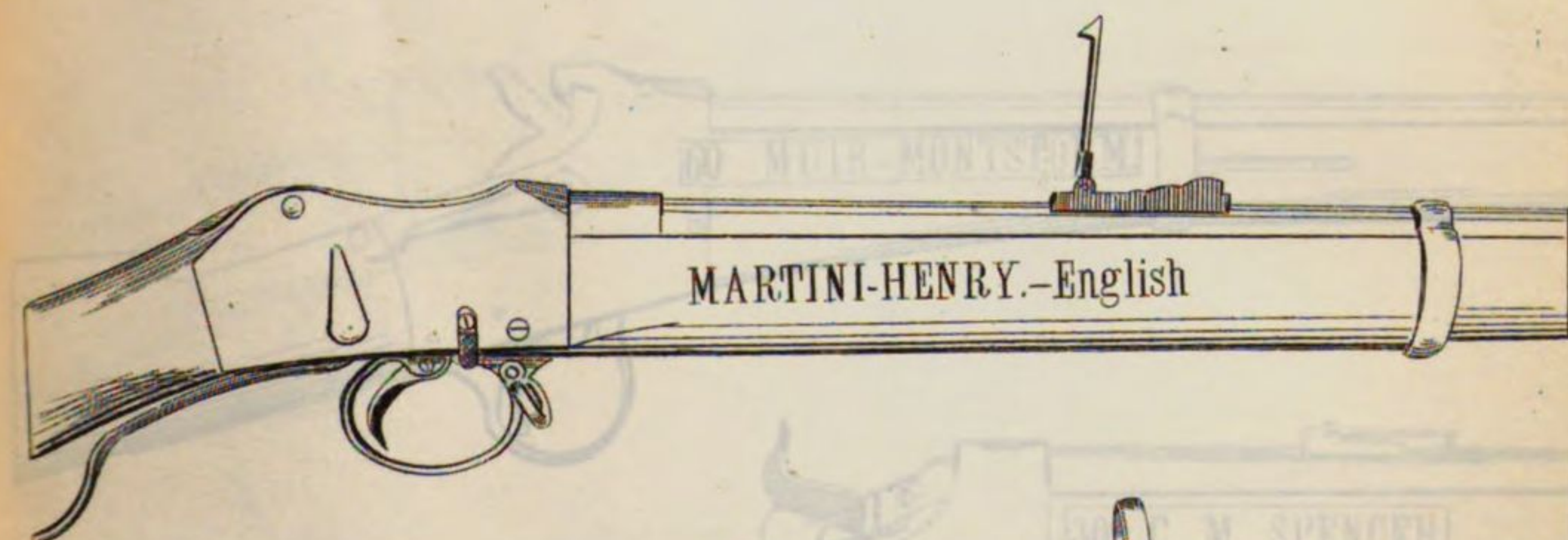
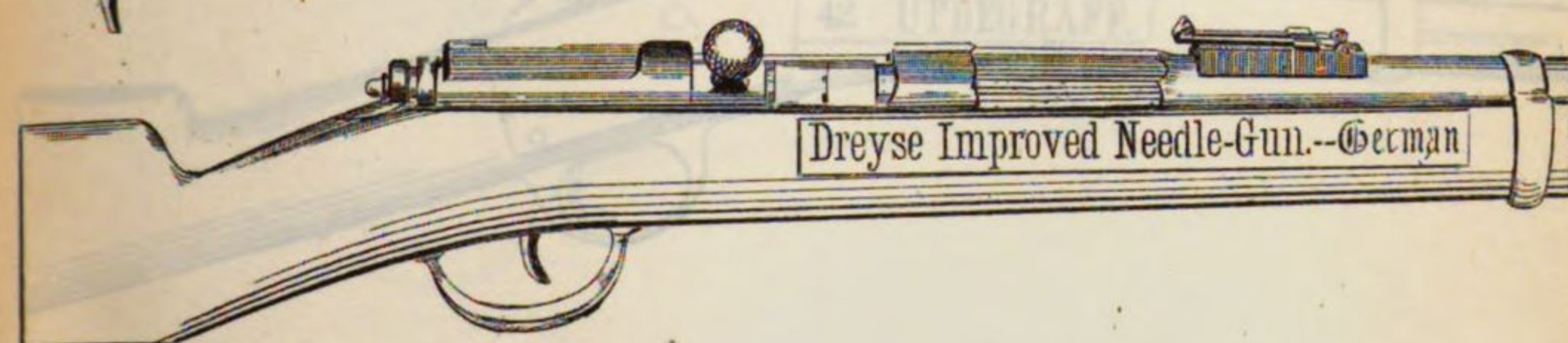
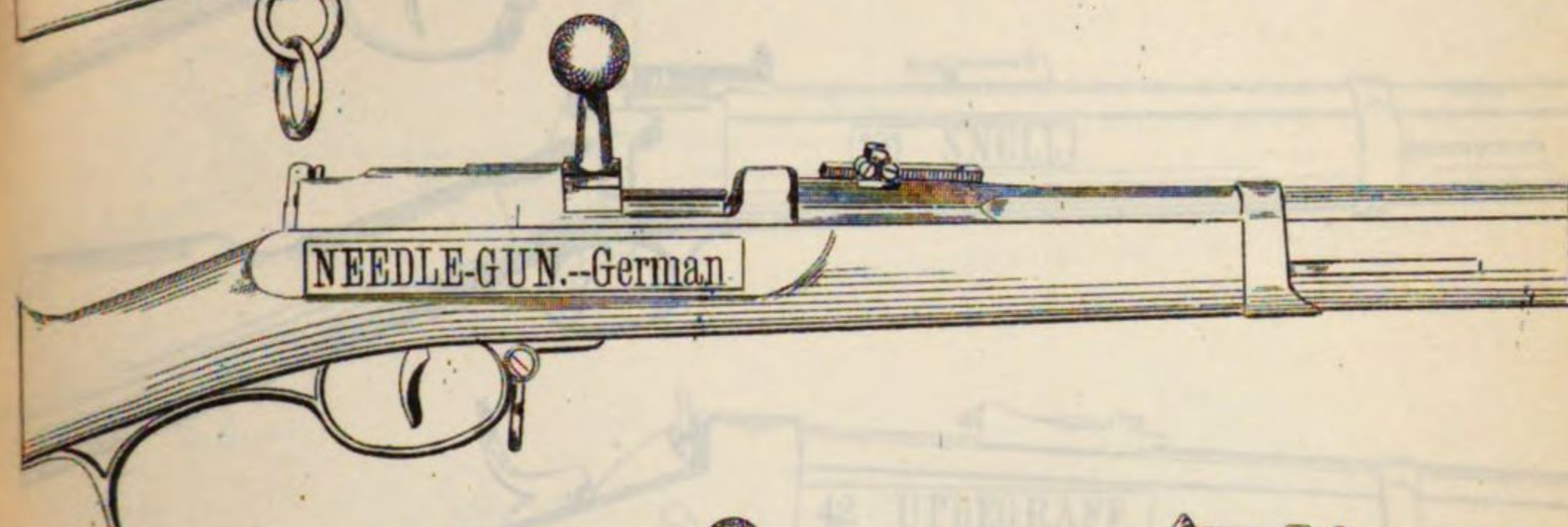
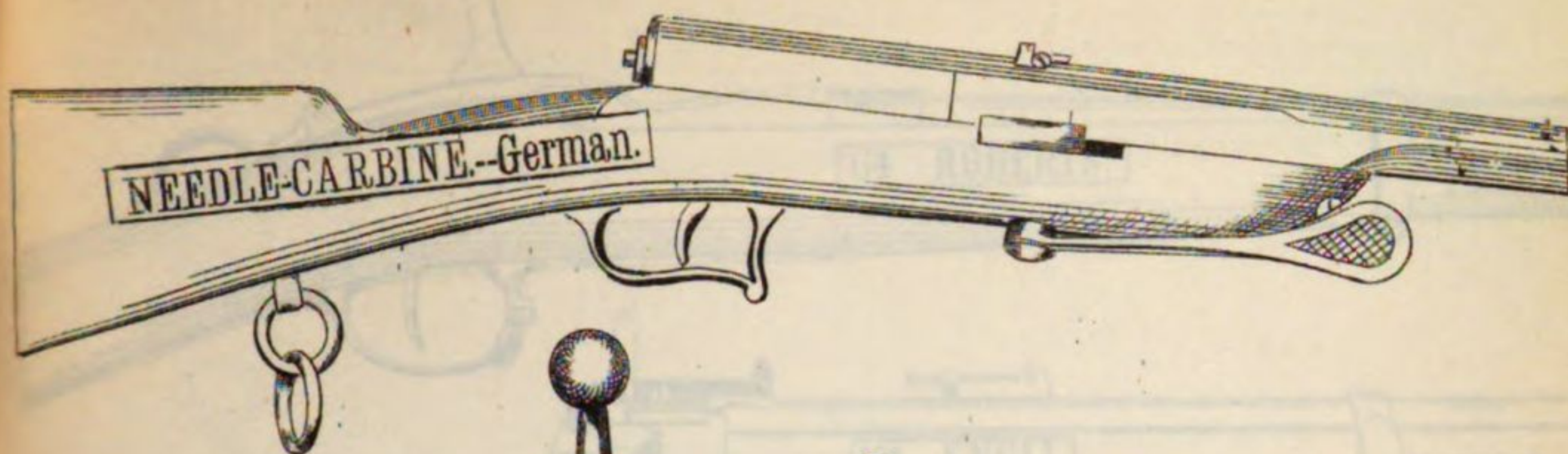


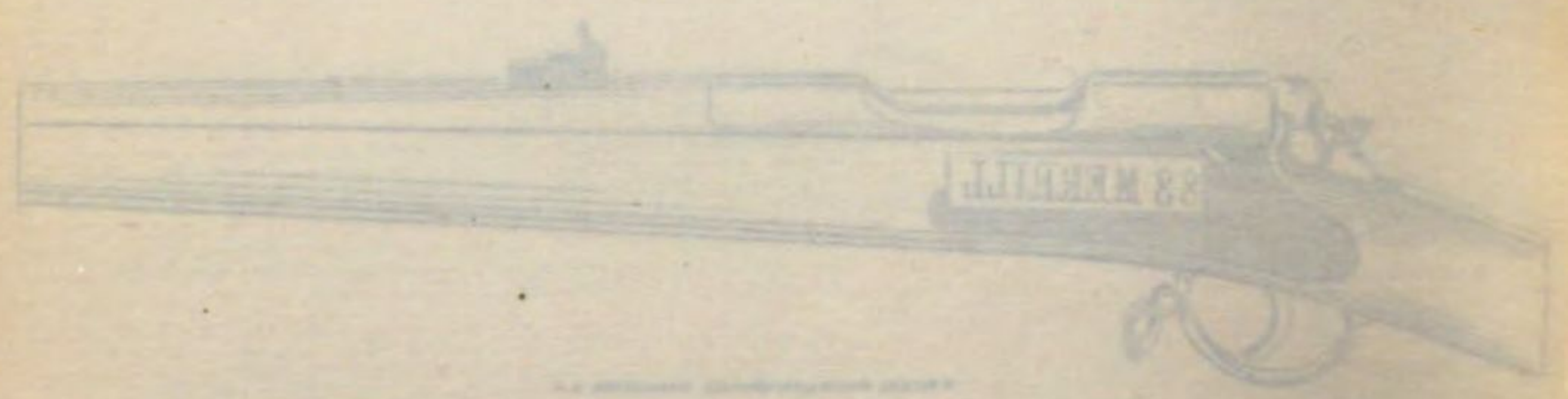
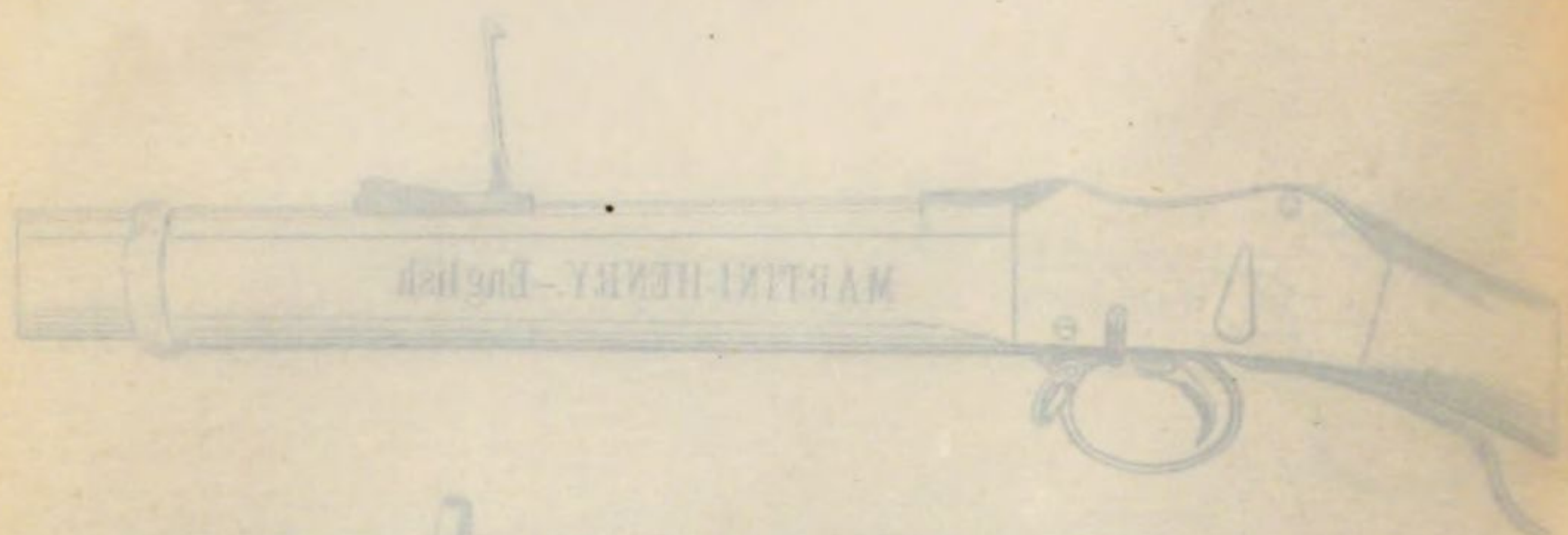
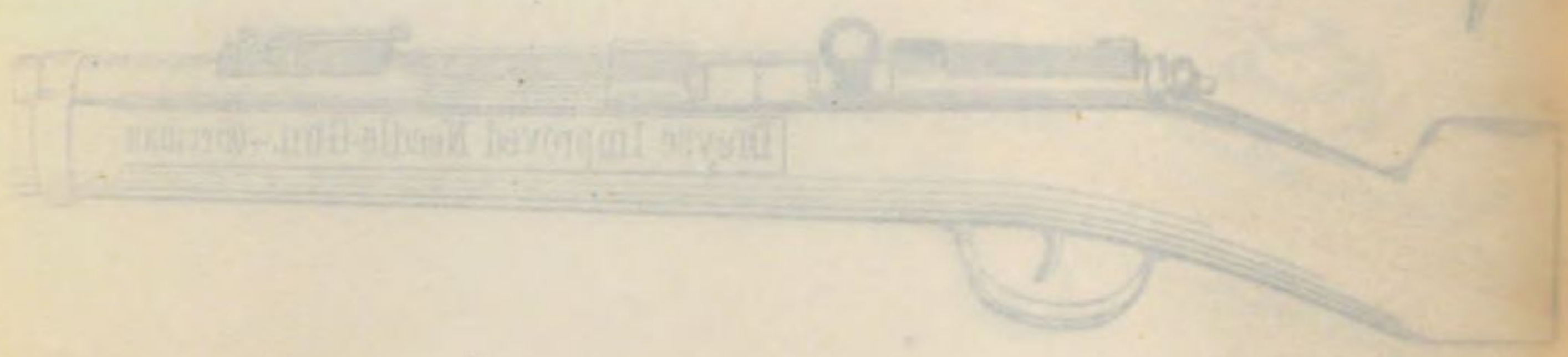
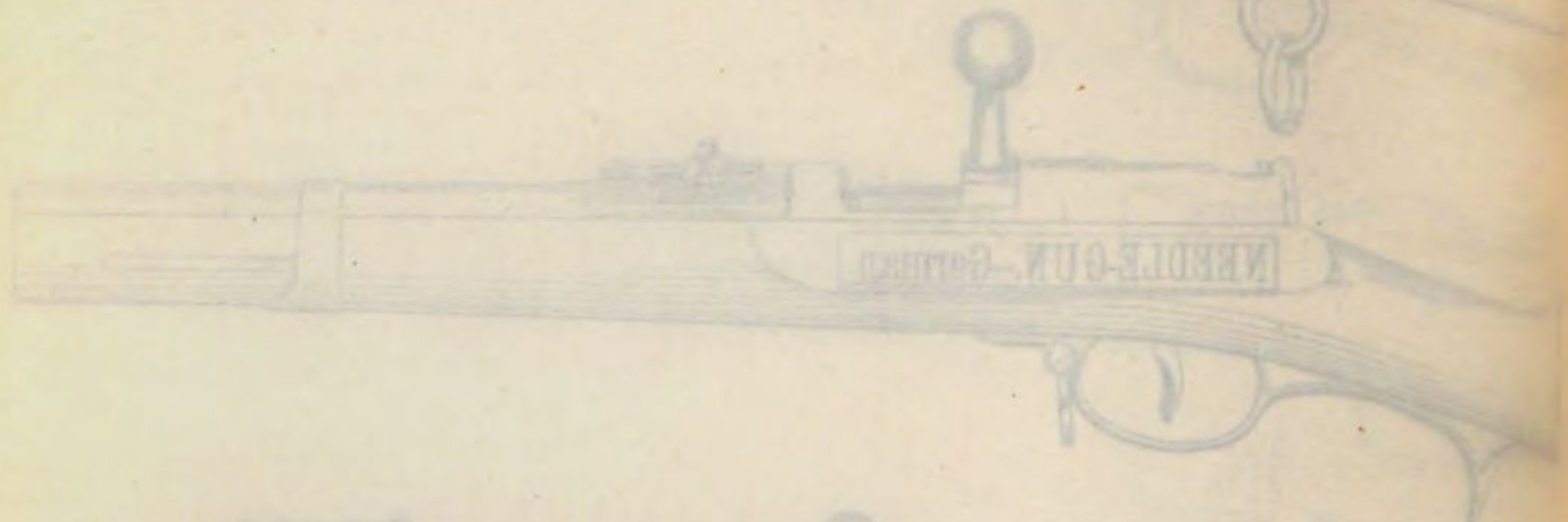


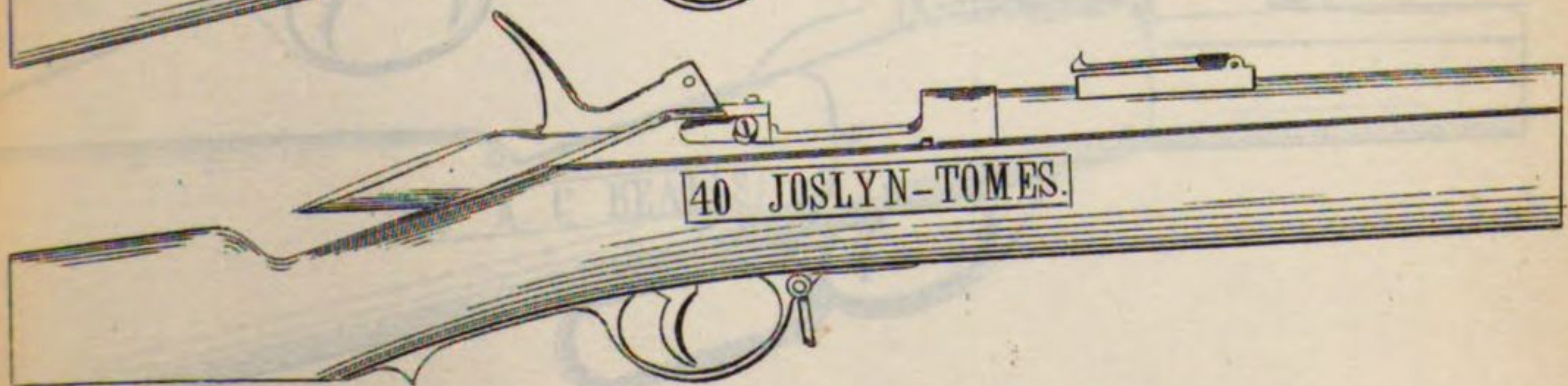
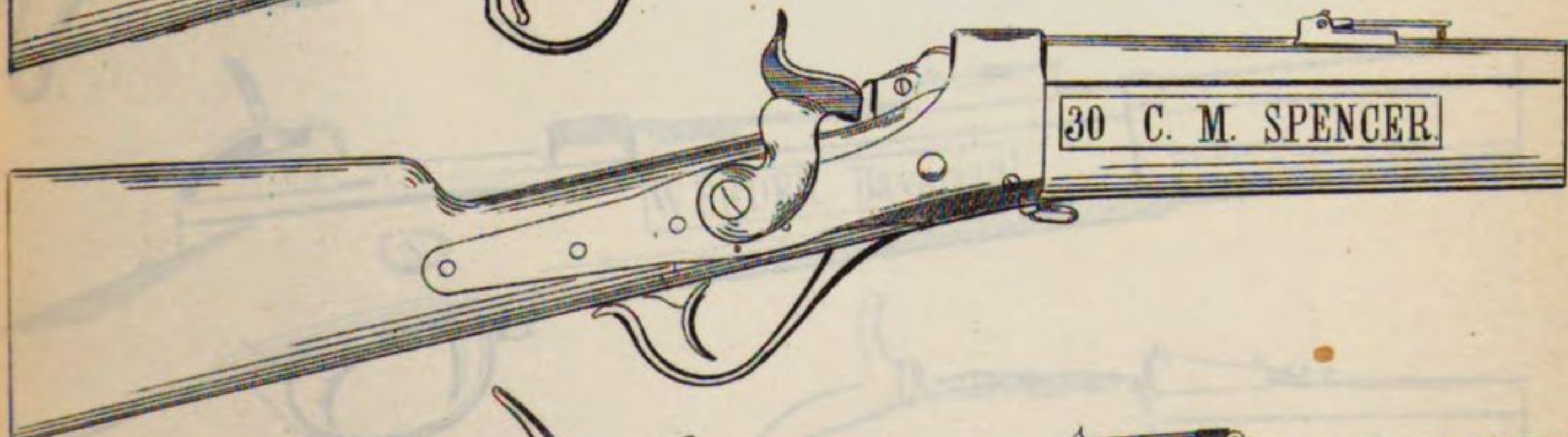
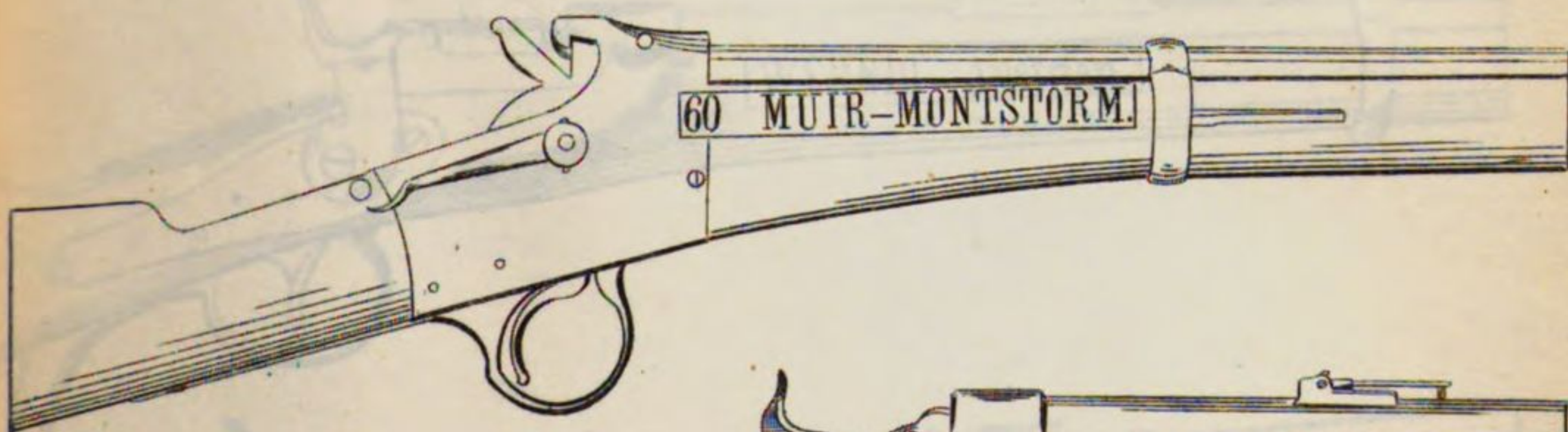
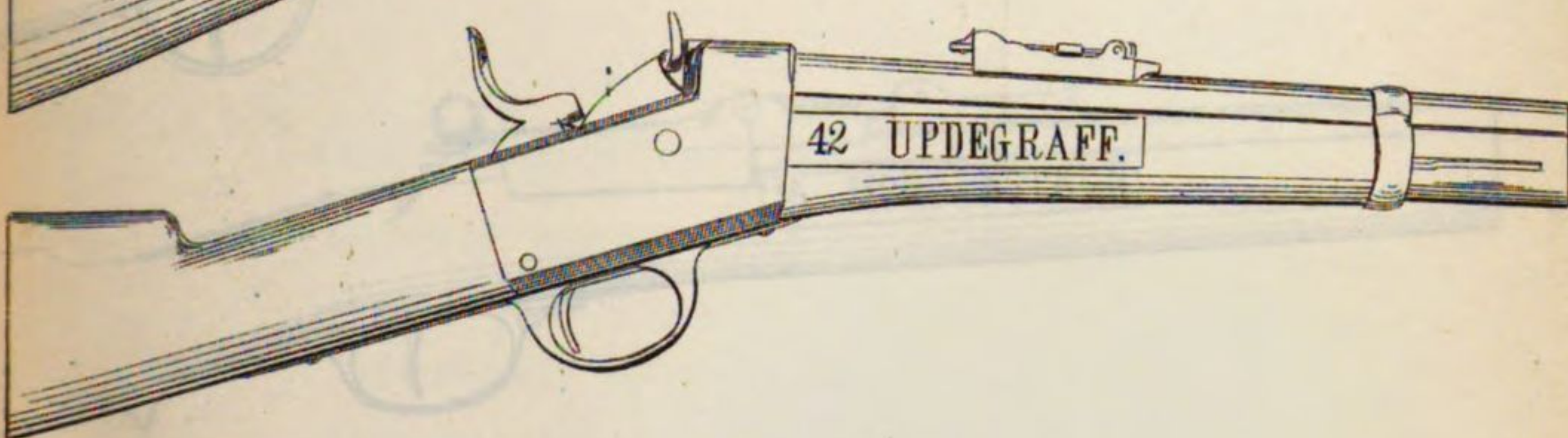
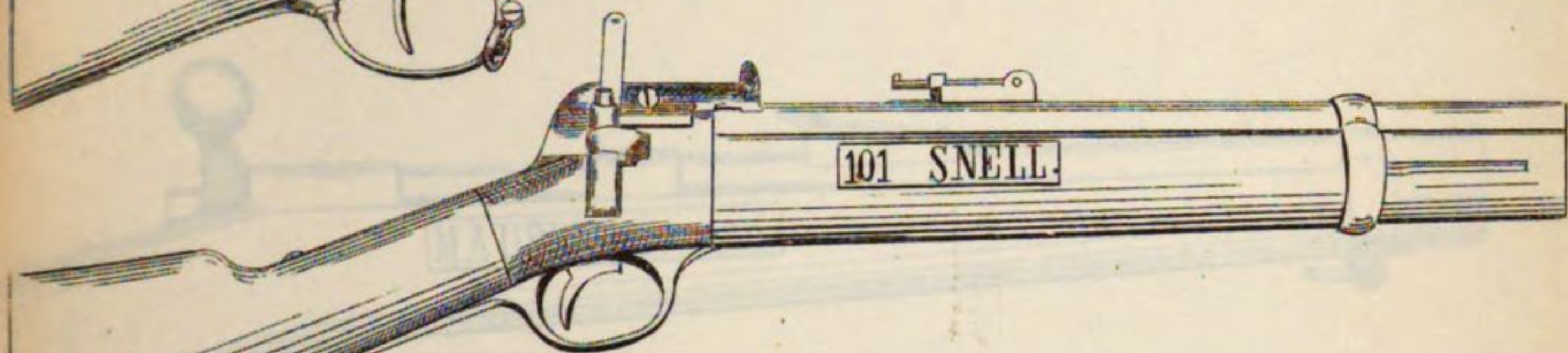
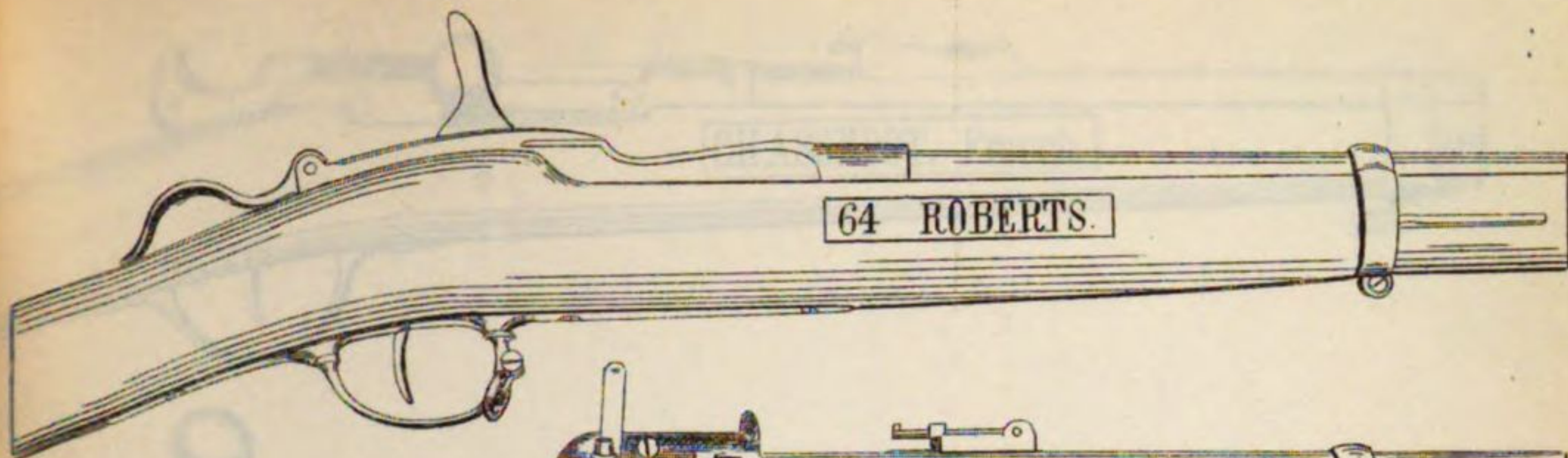


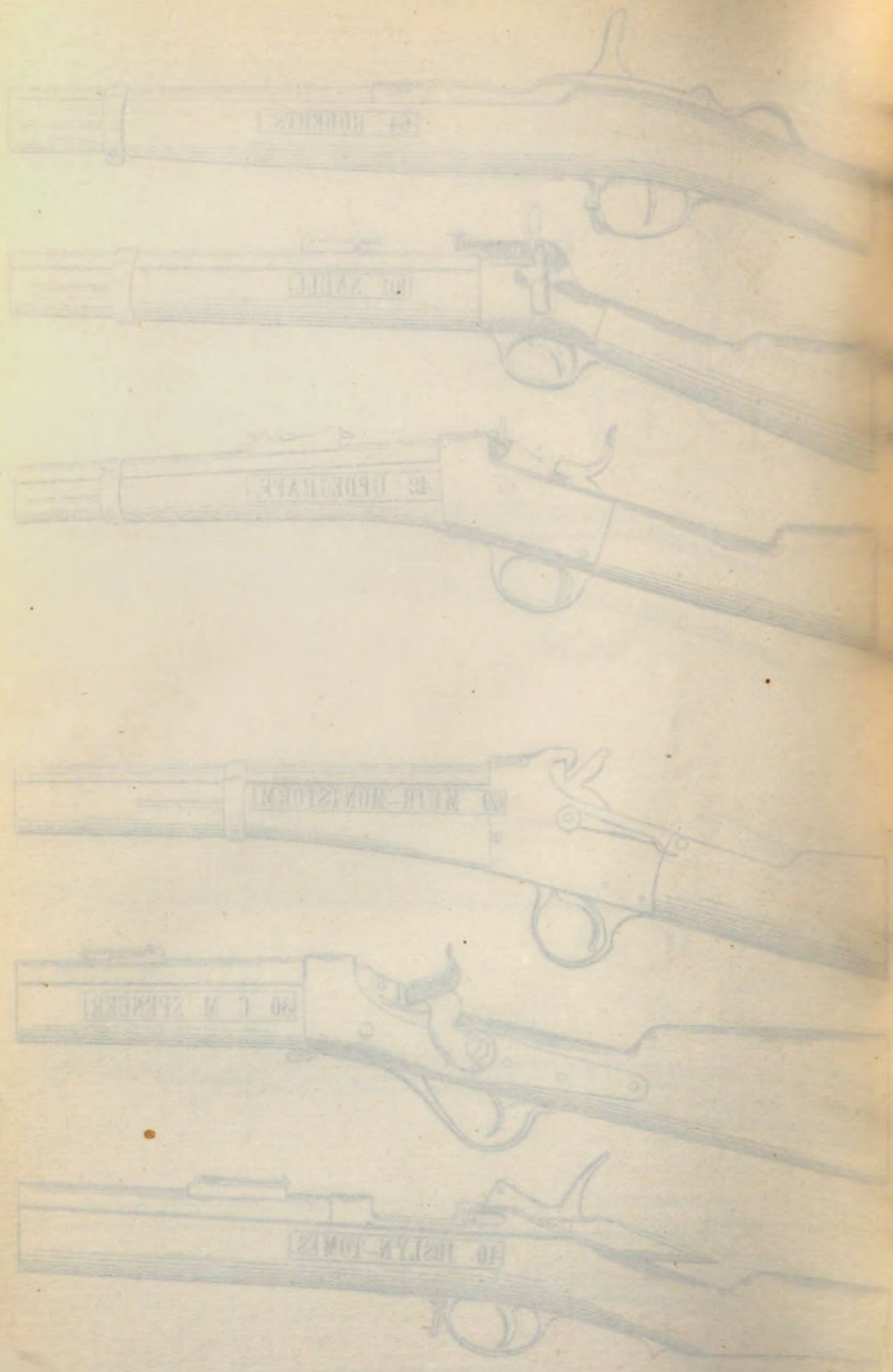


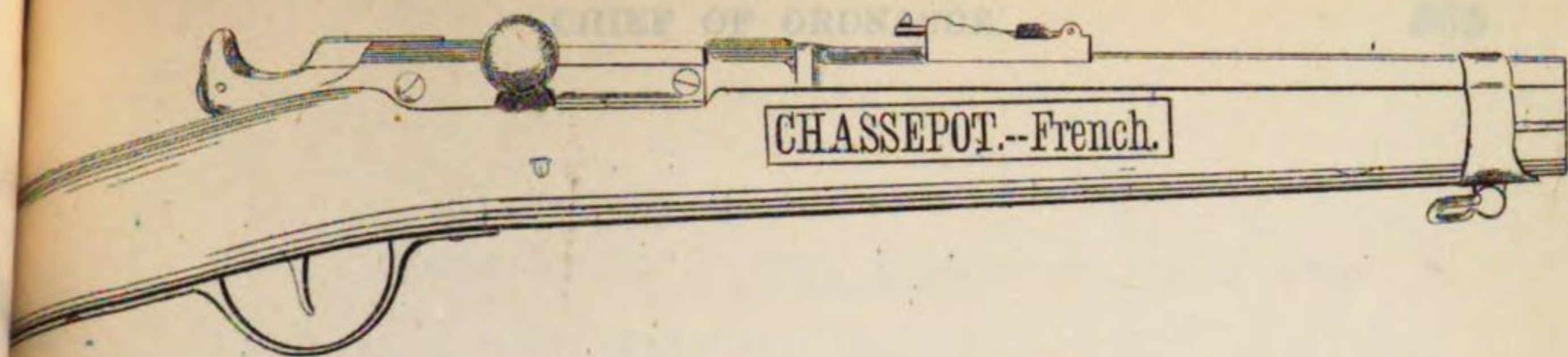




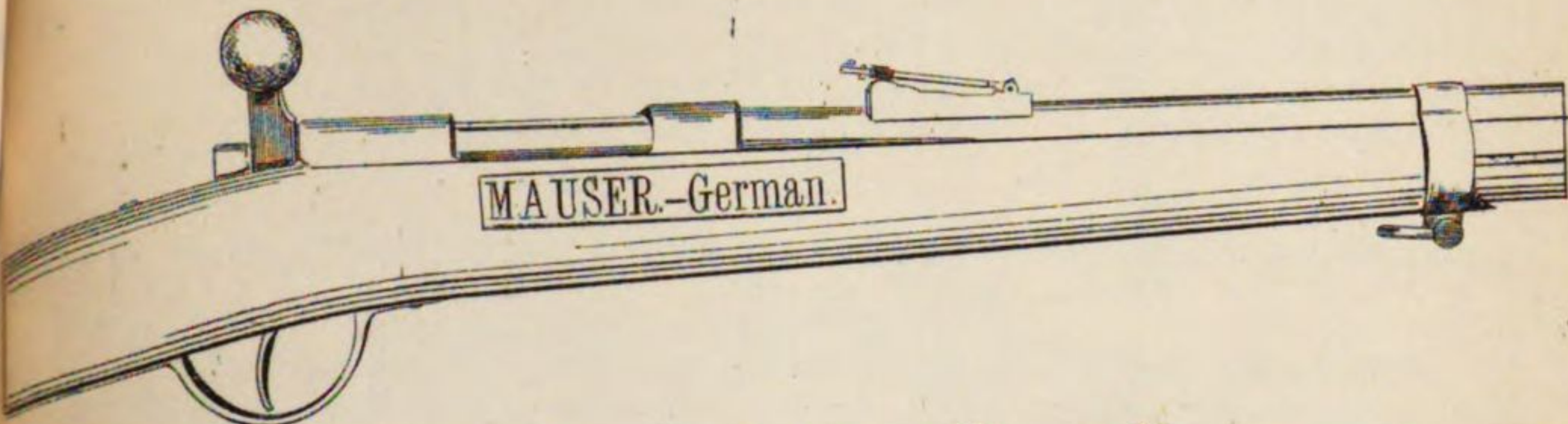




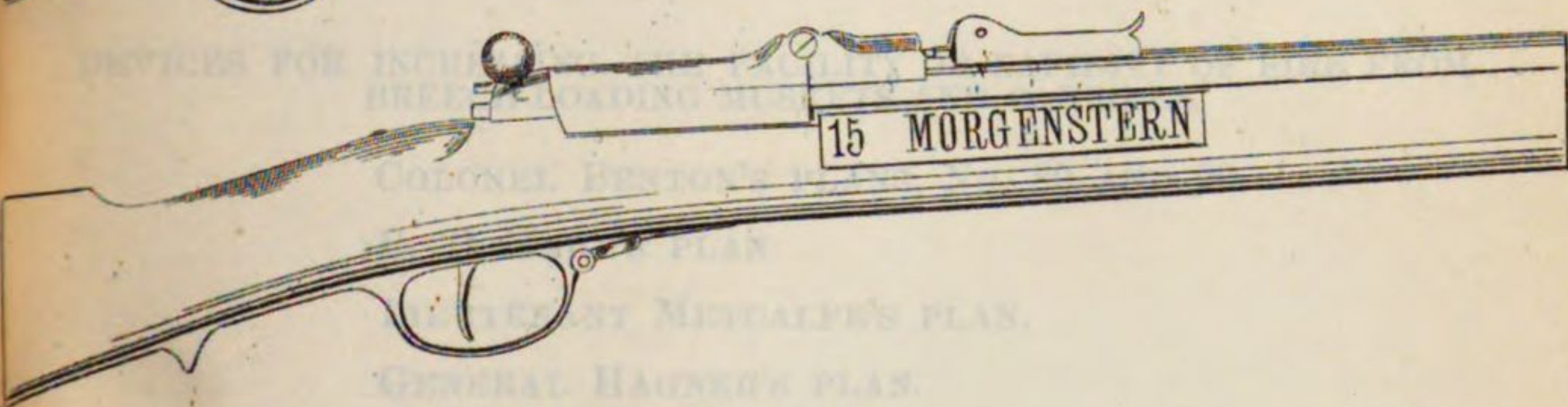




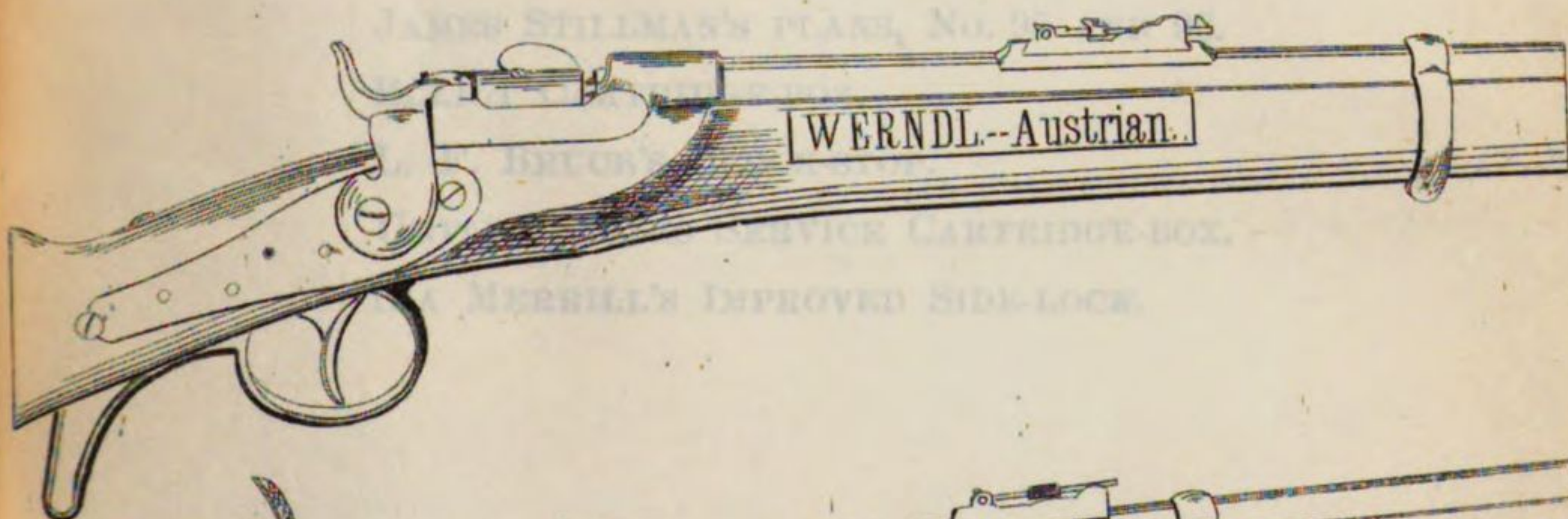
CHASSEPOT.--French.



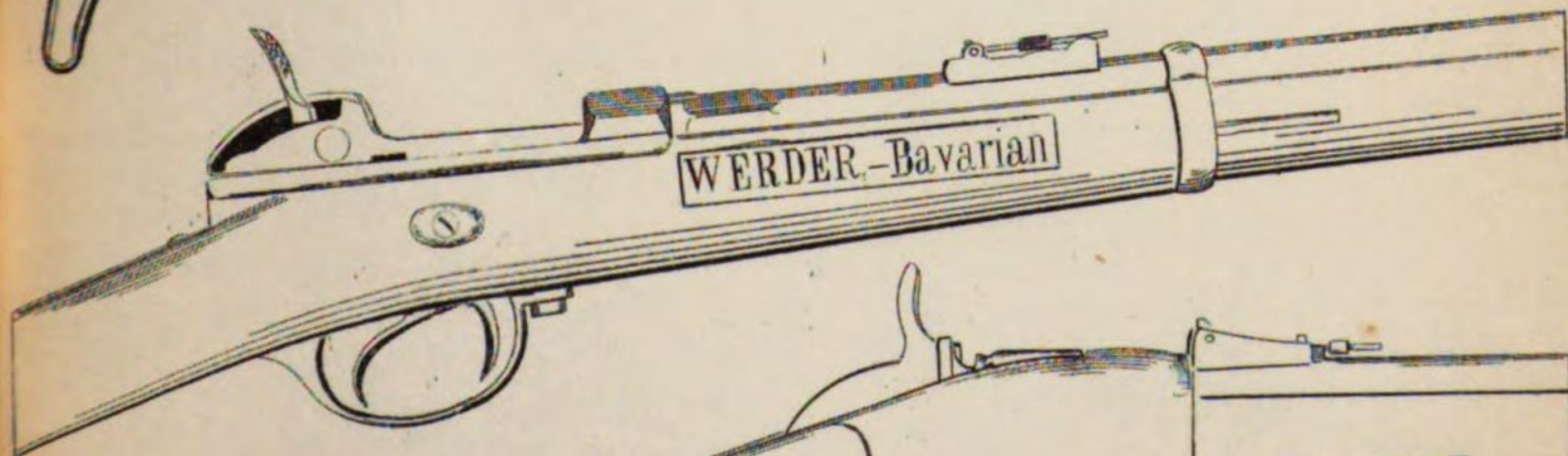
MAUSER.--German.



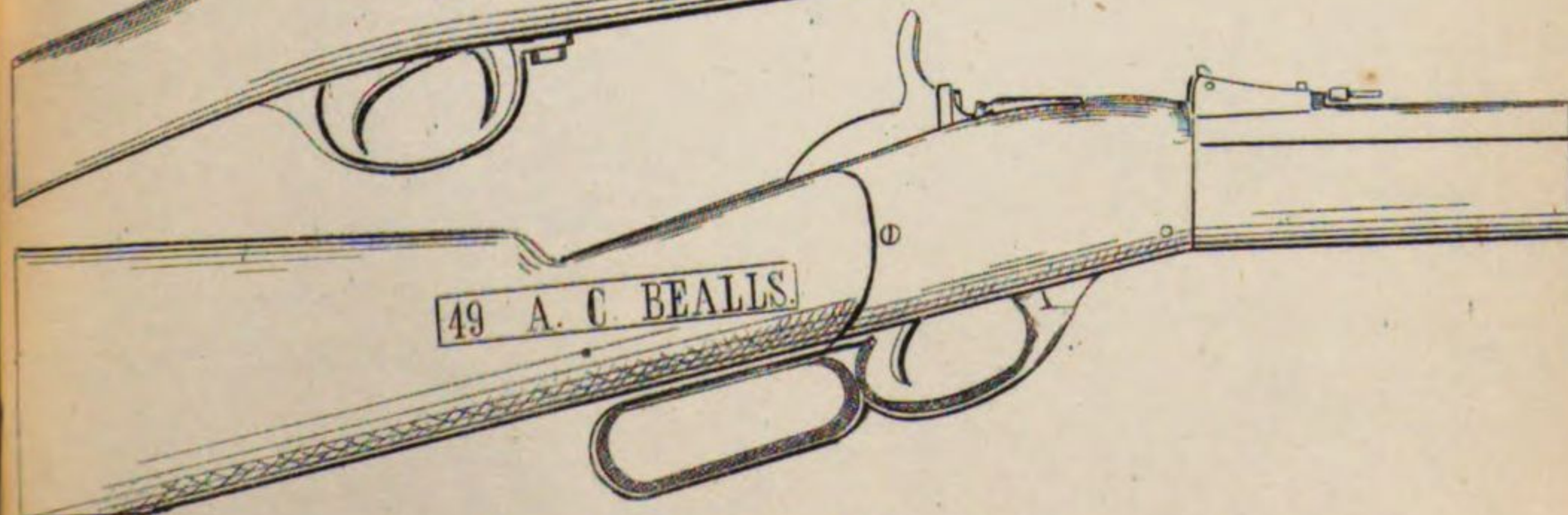
15 MORGENSTERN



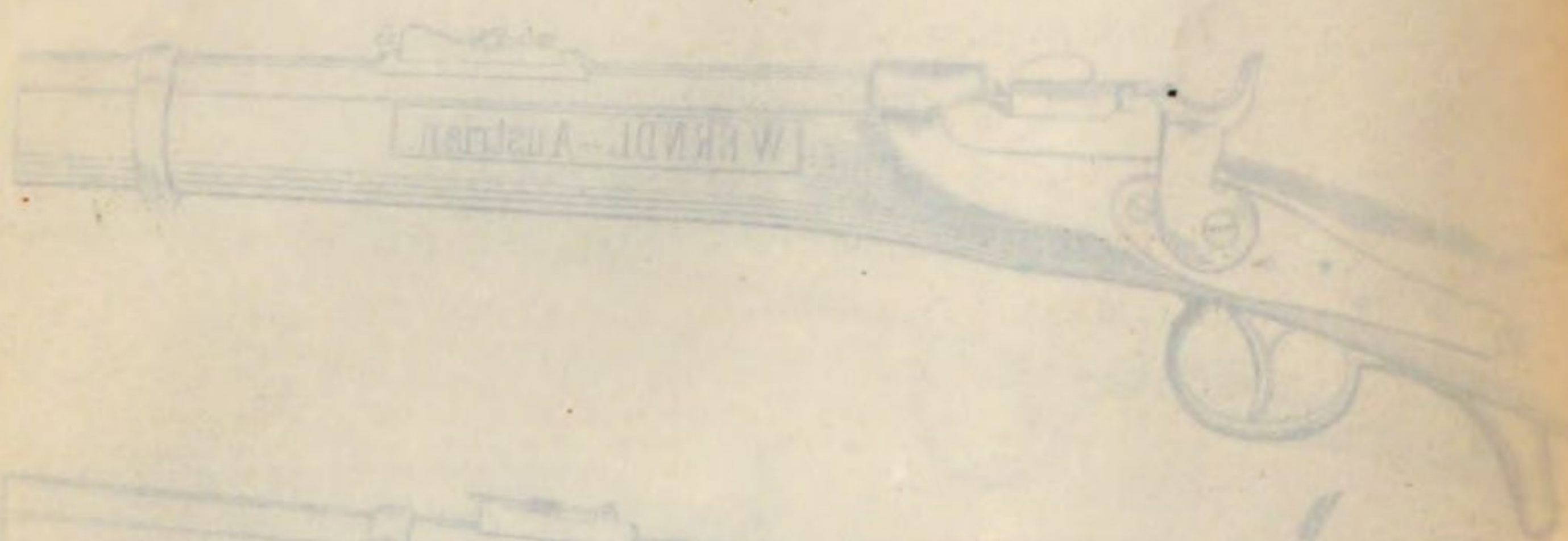
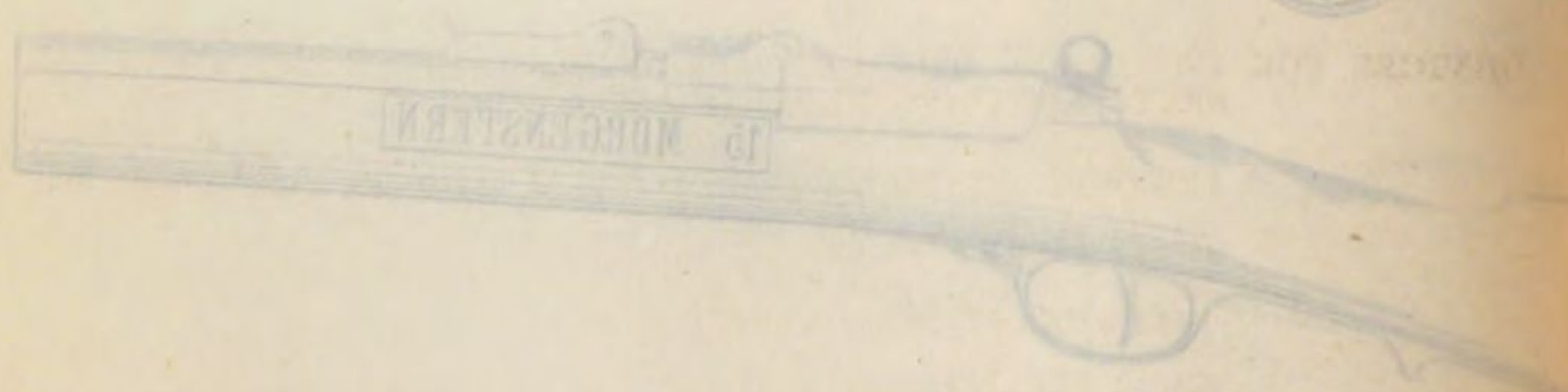
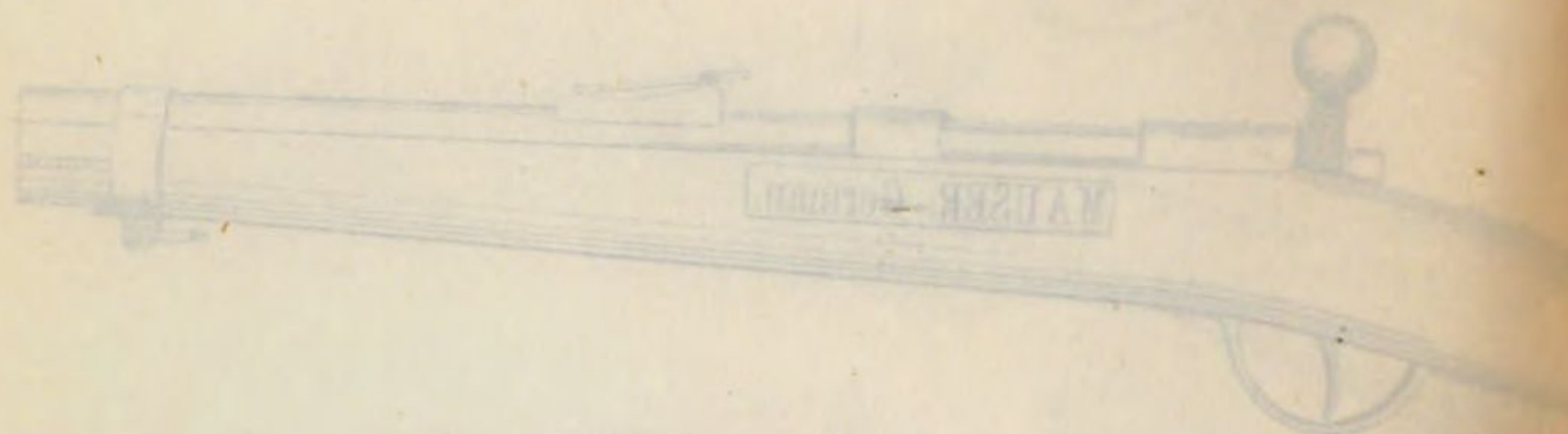
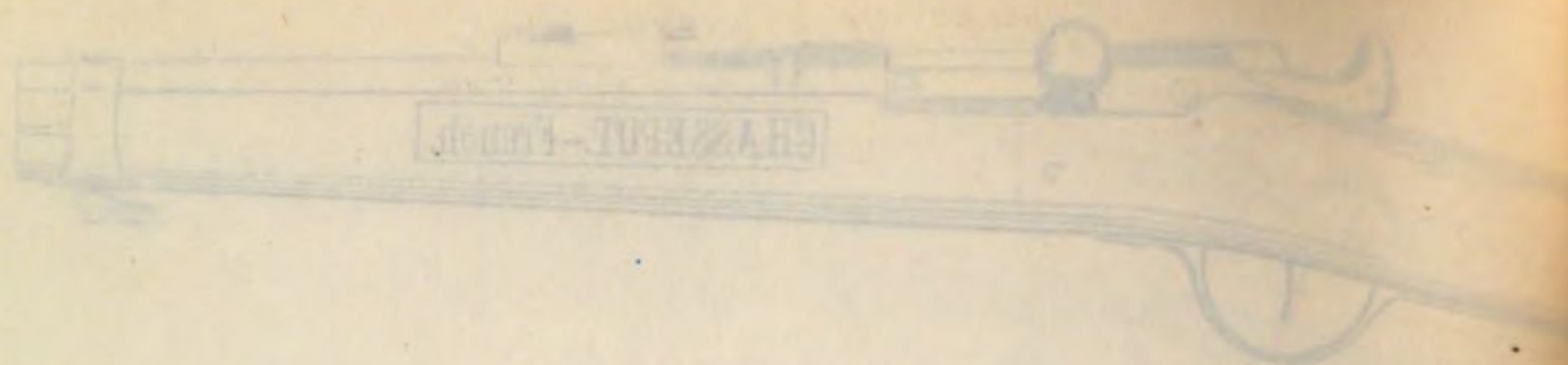
WERNDL.--Austrian.



WERDER.--Bavarian



49 A. C. BEALLS.



DEVICES FOR INCREASING THE FACILITY OR RAPIDITY OF FIRE FROM
BREECH-LOADING MUSKETS AND CARBINES.

COLONEL BENTON'S PLANS, No. 89 AND 90.

R. T. HARE'S PLAN.

LIEUTENANT METCALFE'S PLAN.

GENERAL HAGNER'S PLAN.

IRA MERRILL'S PLAN.

JAMES STILLMAN'S PLANS, No. 95 AND 96.

ELLIOT CARTRIDGE-BOX.

L. F. BRUCE'S BLOCK-STOP.

UNITED STATES SERVICE CARTRIDGE-BOX.

IRA MERRILL'S IMPROVED SIDE-LOCK.

COLONEL BENTON'S FIXED MAGAZINE, No. 89.

That portion of the stock just to the left of the receiver of a Springfield gun is enlarged so as to accommodate five cartridges, caliber .45. They are held in place by a lip on the side of the breech-block when the breech is closed, and when it is opened by the copper bushings described in No. 90.

COLONEL BENTON'S DETACHABLE CARTRIDGE-BLOCK, No. 90.

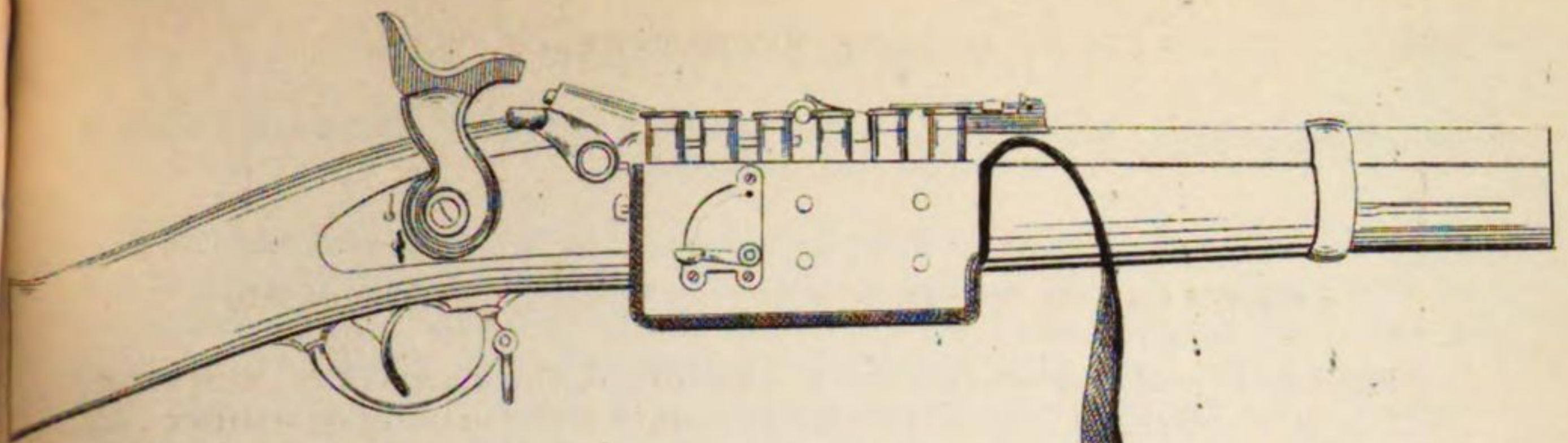
In reducing the lock-plate to the thickness shown in Springfield No. 69, a projecting bolster, (fig. 2,) is left at its forward end, and undercut in front and rear. On to this it is designed to slip a detachable magazine-block holding one row of six cartridges, and faced on the inner side with a plate of steel securely riveted to the body of the block, and containing a dovetail groove, (fig. 1,) corresponding to the bolster on the lock-plate. When fixed, the block is locked in place by a rotary cam on its inner surface, connected with a thumb-piece on the outside and turned by it so as to engage against the lower edge of the bolster. To unfix it, this thumb-piece is turned upward, leaving the block free to be slipped off. The cartridges are held in the block in case of its being accidentally overturned, by copper bushings with which the holes are lined. One side of these bushings, between two near and parallel slits, is bent inward so as to form a friction-spring, which is intended to bear against the cartridge with sufficient force to hold it against its own weight, and yet to permit its ready withdrawal by the hand.

This block is intended to be issued as a part of the soldiers' equipment, and to be carried full in the cartridge-box. To this end, additional protection against dropping the cartridges is afforded by a leather strap, fastened at the forward end of the block and passing over the heads of the cartridges to a button on the other end of the block.

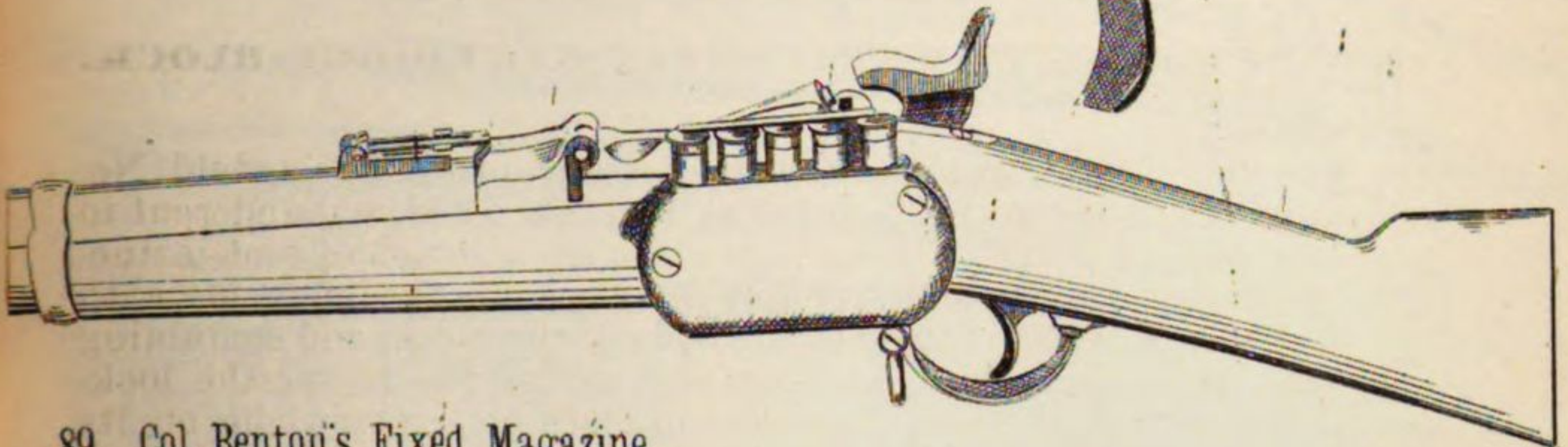
R. T. HARE'S DETACHABLE MAGAZINE, No. 93.

Consists of a block bored for any convenient number of cartridges in one row. On one side is fixed a leathern strap, Fig. 1, between which and the block the left hand is to be passed, the back of the hand being next to the block, and holding the block, as shown in Fig. 2, in a convenient position for loading.

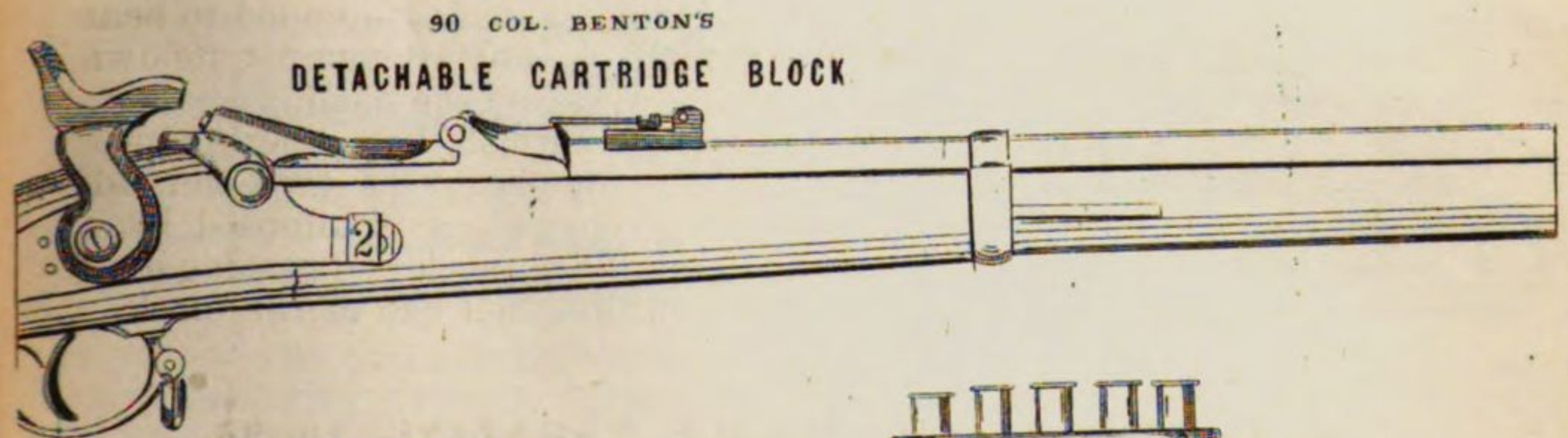
For convenience the block is curved, and the surface next the hand covered with sheep-skin. The cartridge-holes are bushed, as in No. 90. This block is also permanent in its nature, and intended to form a part of the soldiers' equipment.



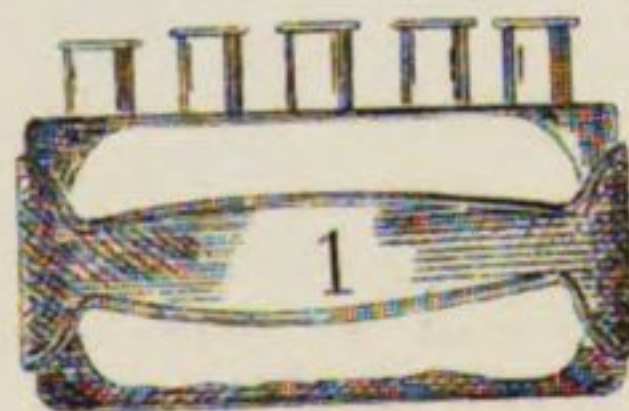
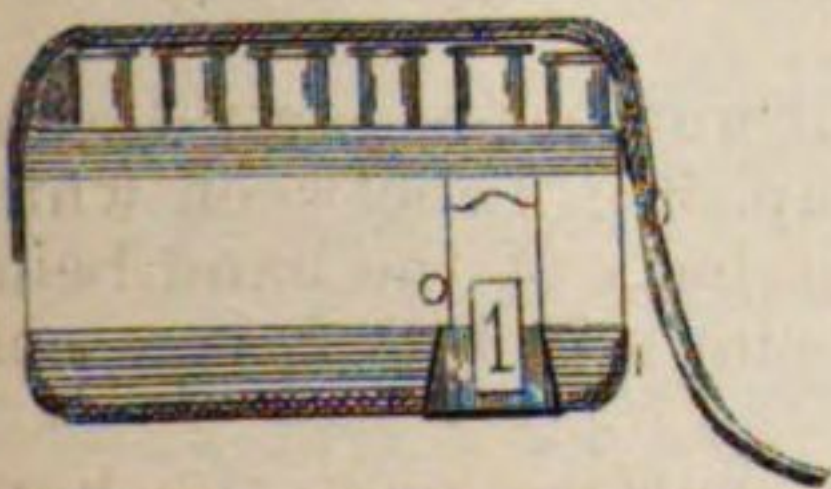
90 COL. BENTON'S
DETACHABLE CARTRIDGE BLOCK



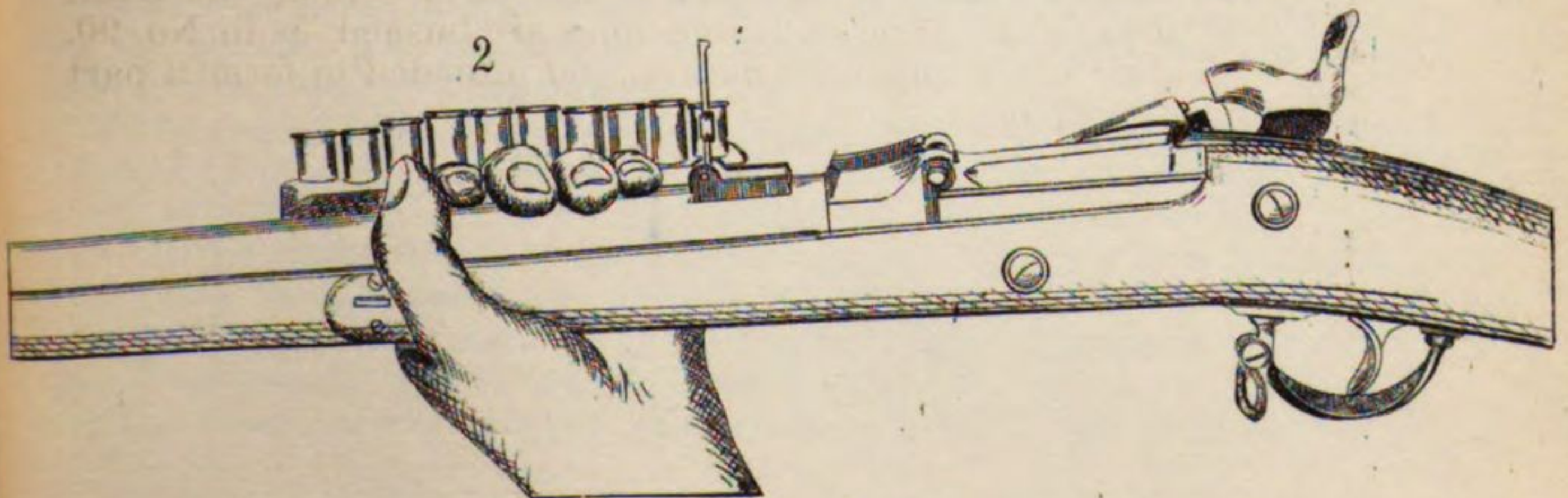
89 Col. Benton's Fixed Magazine.



90 COL. BENTON'S
DETACHABLE CARTRIDGE BLOCK



93 R. T. Hare's Detachable Magazine.

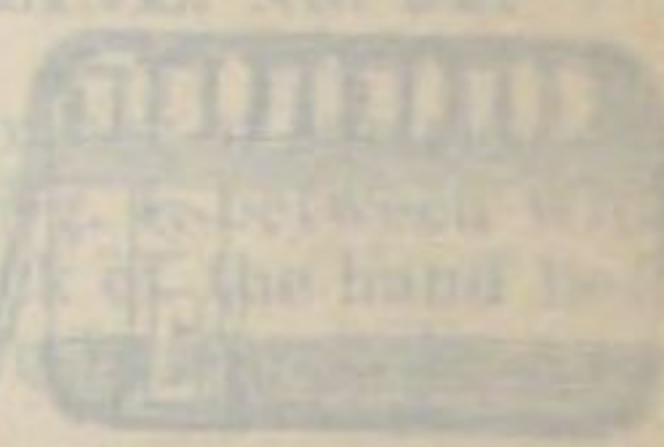
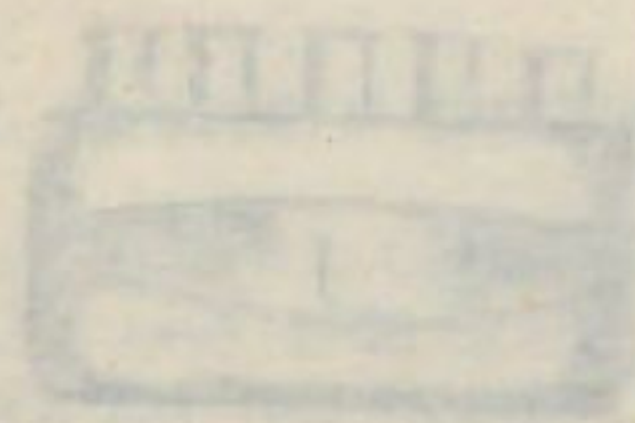




DETACHABLE CARTRIDGE BLOCK



DETACHABLE CARTRIDGE BLOCK



DETACHABLE CARTRIDGE
BLOCK, No. 91

This block is made of wood, 10 inches long, 4 inches wide, and 2 inches thick. It is designed to hold a detachable cartridge in position for firing. The block is divided into two main sections by a vertical groove. The front section is 6 inches long and 4 inches wide, and is designed to hold the cartridge in position. The rear section is 4 inches long and 4 inches wide, and is designed to hold the firing pin in position. The block is made of wood, and is painted black.

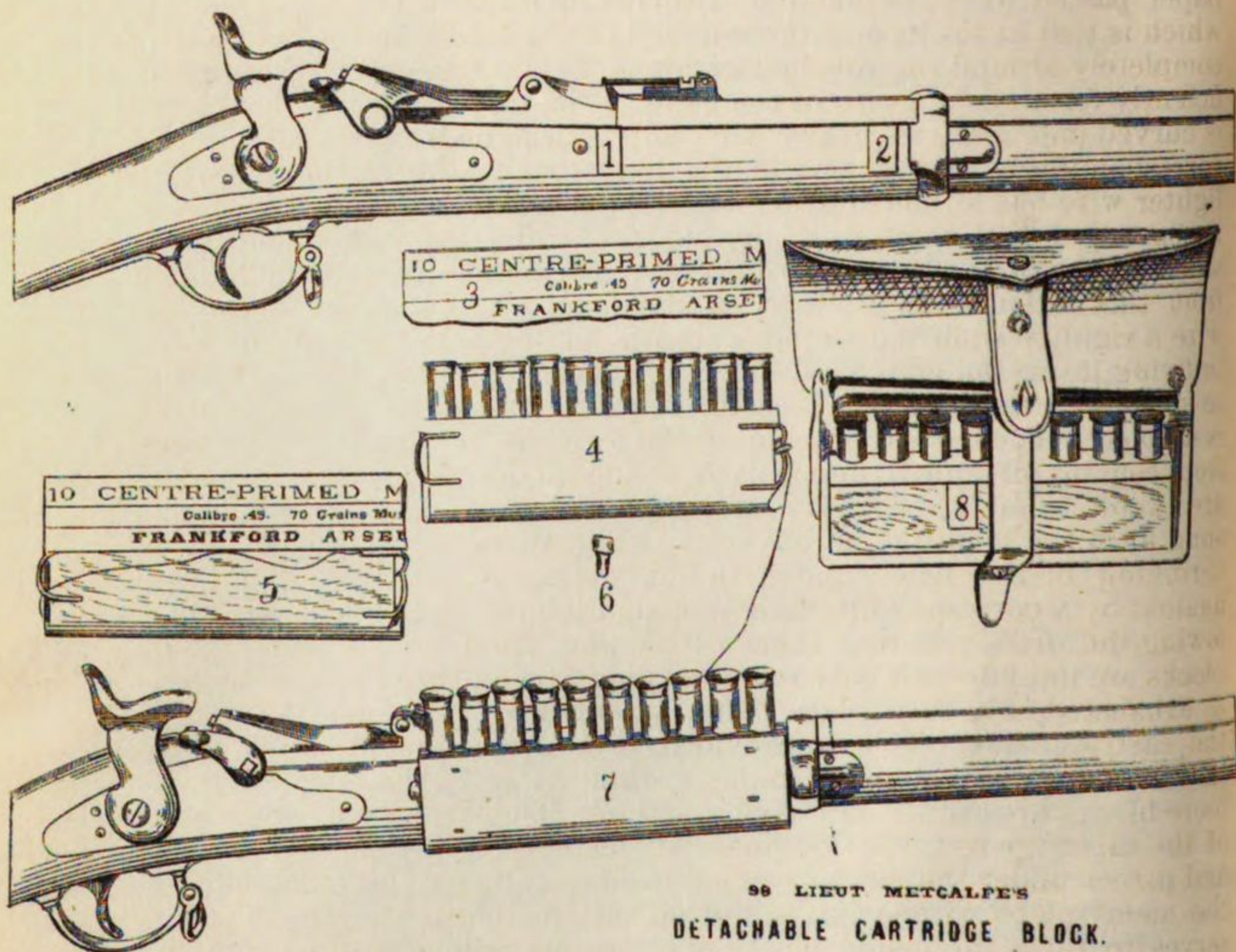
The block is designed to be used in a variety of ways. It can be used to hold a single cartridge in position for firing. It can also be used to hold a number of cartridges in position for firing. The block is designed to be used in a variety of ways, and is a very useful tool for the gunner.

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1. Musket with Block unfixed ; showing end of undercut Stay Pin.
2. Same : showing lip on Lower Band, and head of Band Key and Escutcheon.
3. Lid of Block, cut off by the string.
4. Body of Block.
5. Block complete.
6. Stay Pin ; showing head cut to fit the under surface of the Receiver.
7. Block fixed on Musket, ready for firing.
8. Altered Cartridge Box, containing Three Blocks.

LIEUTENANT METCALFE'S DETACHABLE CARTRIDGE-BLOCK, No. 91.

This block is made of white-wood, bored to receive one row of eight cartridges, caliber .50, or of ten cartridges, caliber .45. It is chamfered at each end on one side, on which are iron-wire loops secured by passing through the block and clinching on the other side of it. The heads of the cartridges are protected by a paste-board cap, secured by a strip of paper pasted over its junction with the block, and overlying a string which is tied to the loop at the rear end of the block, and which passing completely around the row of cartridges, has its free end projecting sufficiently for an easy grasp of the hand. The forward one of these loops is curved and made of heavy wire, and is designed for insertion into a correspondingly curved cut in the lower band; the rearmost loop, of lighter wire has an indentation near its upper end, which is intended to be sprung into a notch in a stay-pin, projecting through a hole in the stock at the proper distance in rear of the band. The short bearing from this indentation upward on the loop, gives that portion of the wire a rigidity sufficient to put a stop to an undue descent of the block in fixing it on the gun, while the longer bearing below, allows the wire to spring out and in along its slanting profile, when the proper pressure is applied. The curved bearing of the forward loop prevents the block from coming off unless first raised at the hinder end. The cartridges are kept from accidentally dropping out, by making the holes a snug fit in the longitudinal direction, while undue sticking from lateral shrinking of the holes under the influence of moisture, is guarded against by a corresponding lateral elongation of the holes, made by allowing the drill in boring them a little play from side to side. These blocks are intended for only temporary use, being thrown away as soon as exhausted, and their place being supplied by fresh ones taken from the cartridge-box. This is provided with a metallic plate outside, to hold one block in a manner similar to that shown in the gun, while two more blocks are carried in a pouch within. The strap seen in the view of the cartridge-box, has its inner end fastened to the back of the box, and passes under the blocks carried inside, and over the block held by the metal plate without, to a button on the bottom of the box. It serves to raise the inside blocks into an accessible position, and by holding down the outside block, to permit the taking from it of single cartridges when desired. The block is fixed on the gun by engaging its forward end with the curved cut in the band, and then pressing down the hinder end until the indentation of the loop springs into place on the stay-pin. By then seizing the free end of the string and giving it a pull, it will cut through the paper, and at the conclusion of its course, throw off the paste-board cap; the cartridges can then be used at pleasure. In arms of the Springfield type the natural motion of opening the block brings the hand directly to the cartridge. The band is held against the shock of the recoil by a key passing through a recoil stud on the barrel. The position of the block serves to guard the hand from burning in rapid and continuous firing.

NOTE.—In a later model of this block, the recoil-bearing is directly upon the key, which is placed in rear of the ordinary lower band. Its head is cut as in the band above described. Instead of the heavy wire loop at the forward end of the block, a piece of sheet-iron is tacked on. The holes in the wood are cylindrical, and of nearly the diameter of that portion of the cartridge at their upper edge. In case of shrinkage, this arrangement makes the surfaces in contact very small. After filling the block, it is varnished all over, to protect it from dampness.

IRA MERRILL'S MAGAZINE, No. 94.

The comb of the butt-stock is cut out in a groove deep enough to receive one cartridge, cal. .45, on end, and long enough to accommodate four or five of them side by side. A movable back for this groove is formed by a follower-block, which is pressed forward by a spiral-spring, carrying the cartridges ahead of it to the mouth of the magazine, from which they are to be picked out one by one. The magazine has a sliding cover by which, in traveling, the cartridges are to be kept from falling out.

GENERAL HAGNER'S FIXED MAGAZINE, No. 92.

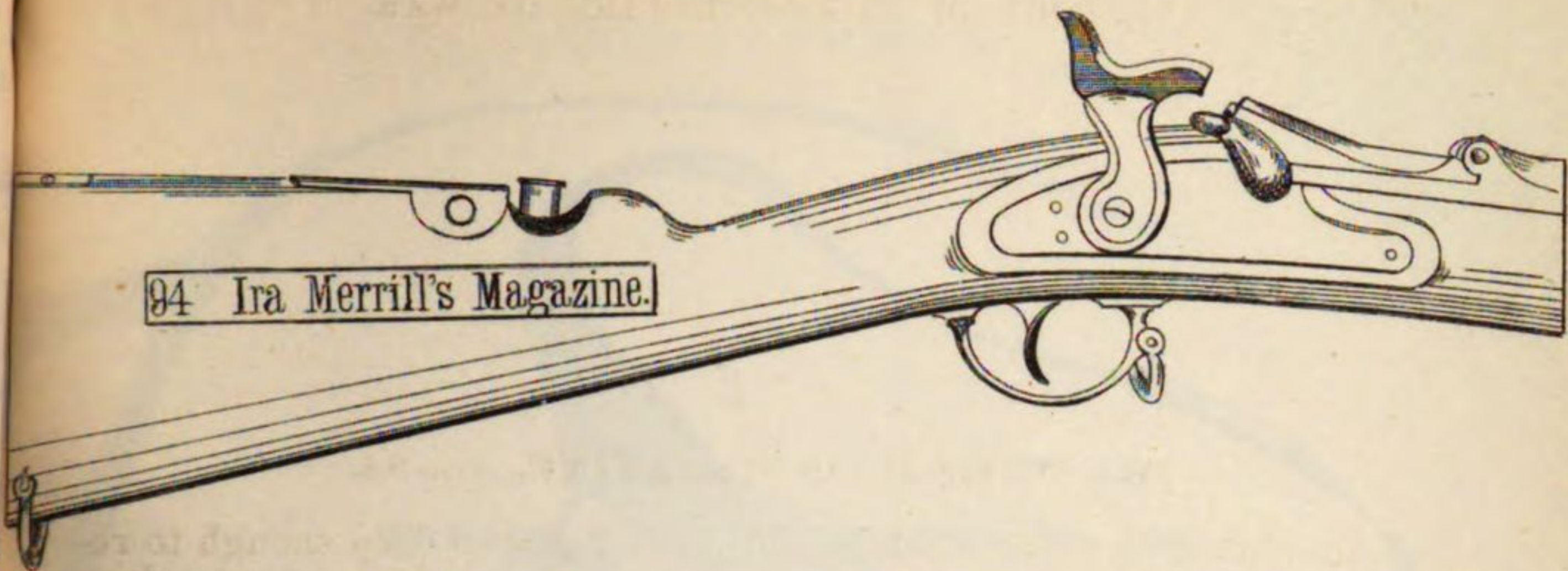
A projection is formed on the under side of the stock between the lower band and the guard, in which three cartridges are placed, their heads being to the rear. They are held in place by means similar to those described in No. 90.

JAS. B. STILLMAN'S MAGAZINE, No. 95.

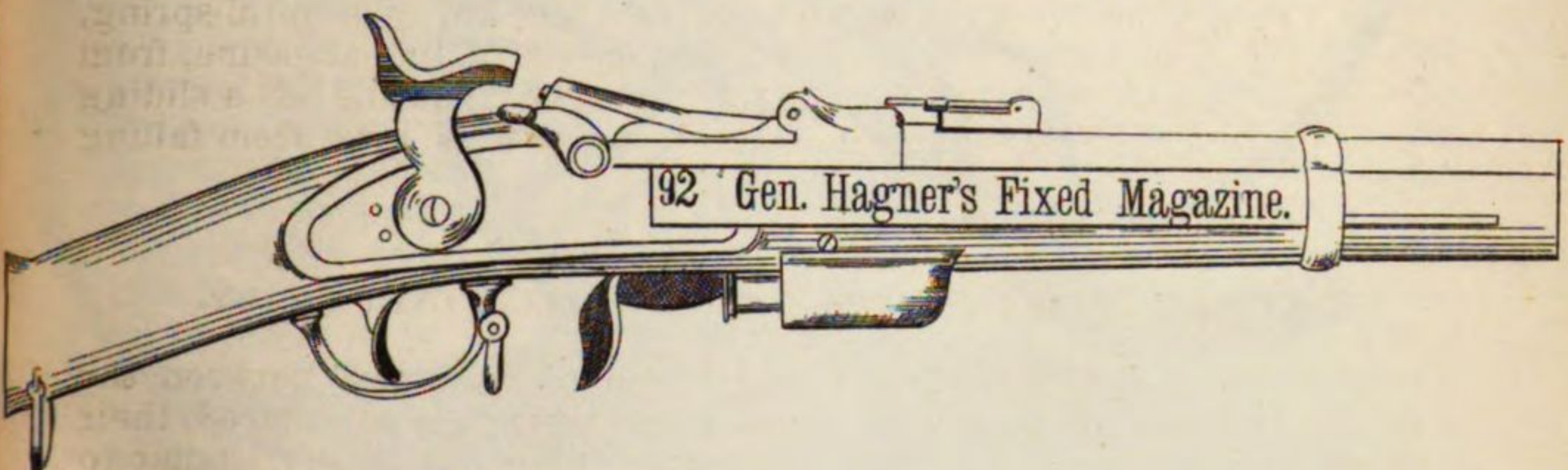
The comb of the butt stock is counterbored for four musket cartridges, cal. .45. They are kept in place by a lid swinging backward, which is kept open when raised, and shut when closed, by a flat spring bearing on corresponding flat surfaces on the hinge. When the lid is raised the cartridges are kept from accidentally falling out by copper bushings, as in No. 90.

JAS. B. STILLMAN'S MAGAZINE, No. 96.

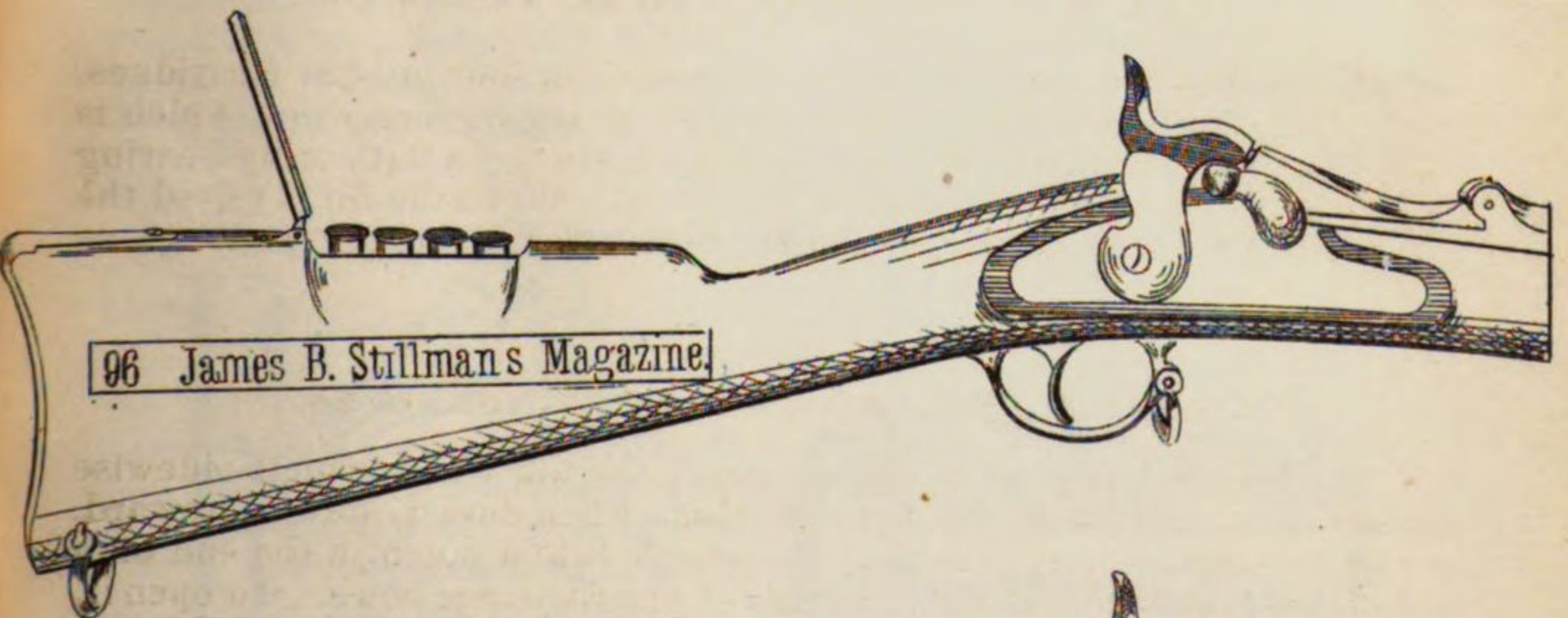
Like No. 95 except as to the motion of the lid, which swings sidewise in opening, and the forward end of which when closed, springs upward, from the elasticity imparted by its length, into a notch in the end of a plate let into the stock just in front of the cartridge-holes. To open it, the forward end is depressed until out of the notch, when the lid may be swung aside.



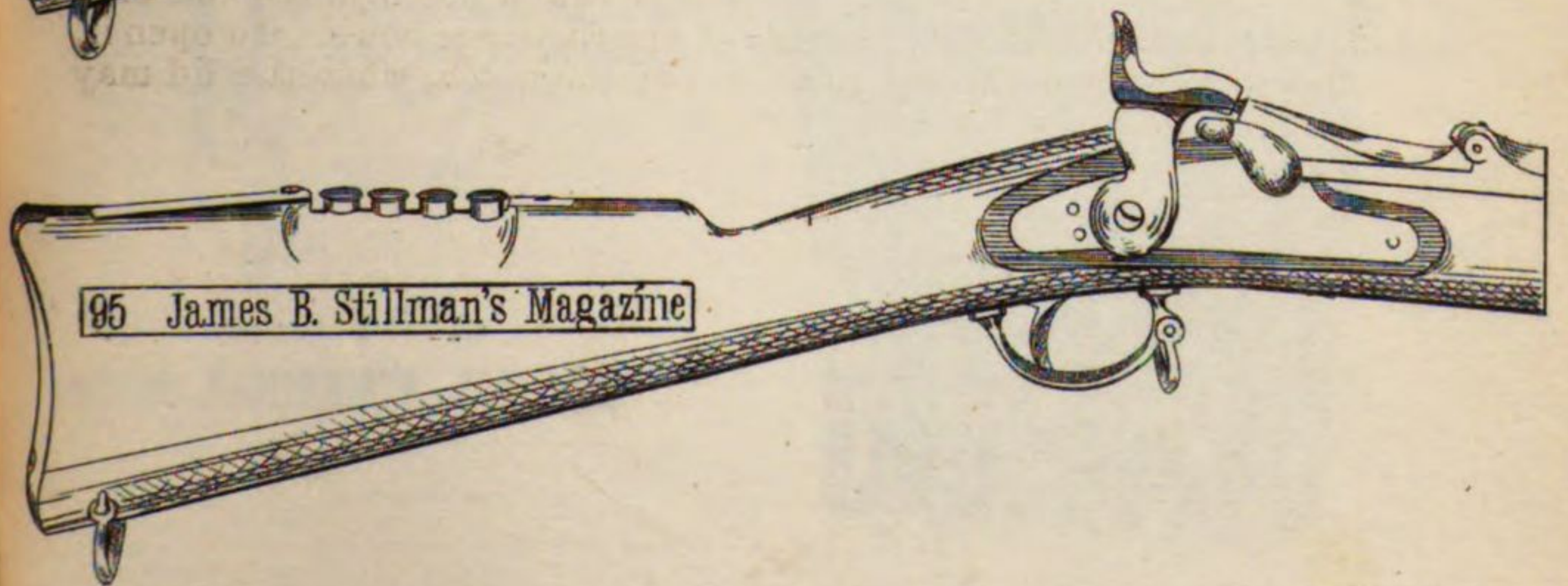
94 Ira Merrill's Magazine.



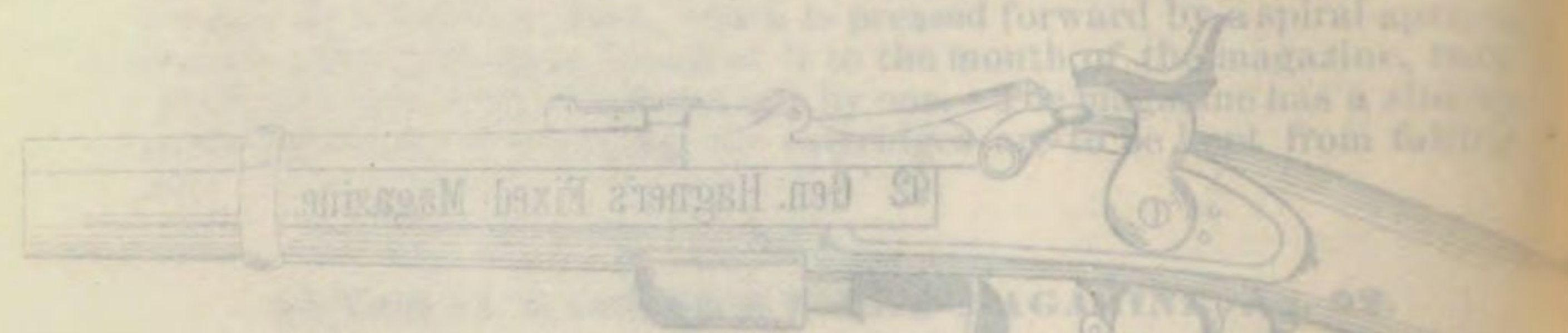
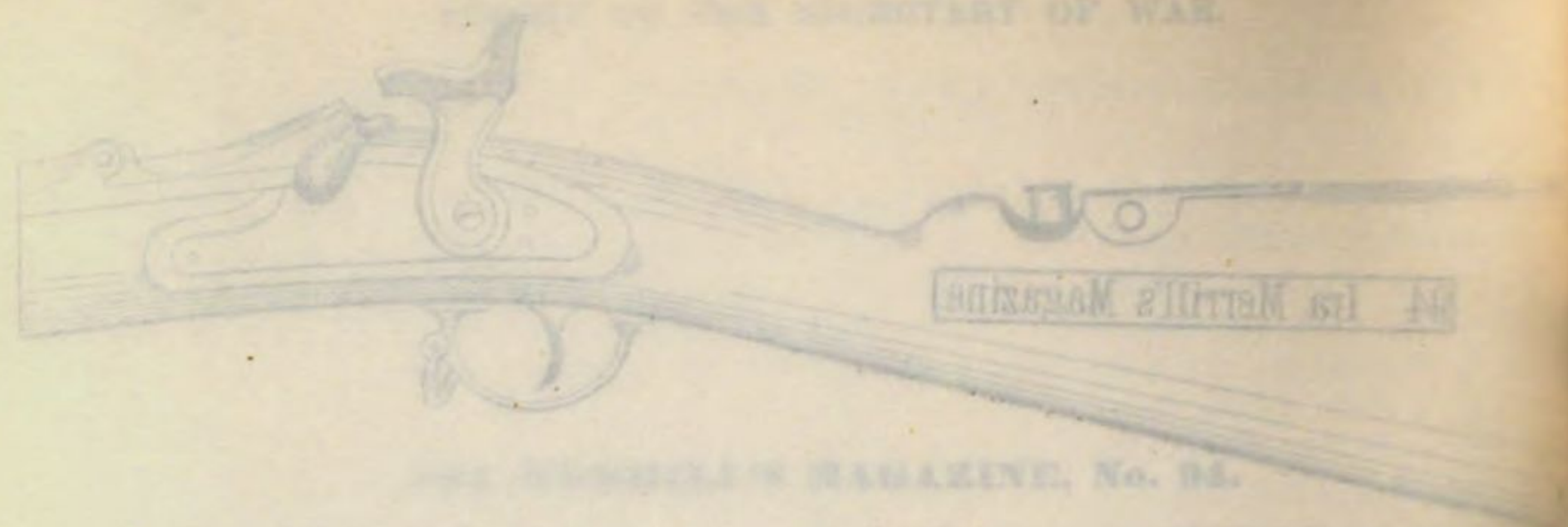
92 Gen. Hagner's Fixed Magazine.



96 James B. Stillman's Magazine.



95 James B. Stillman's Magazine.



ELLIOT'S CARTRIDGE-BOX, No. 100.

Consists of two boxes, one on each side, by which the cartridges are held in position. The boxes are made of metal, and are covered with leather. The boxes are attached to the belt by a strap, which is fastened to the buckle. The boxes are designed to hold the cartridges in such a position that they can be taken out of the box by the hand, and inserted into the cartridge without the need of any other device. The boxes are also designed to hold the cartridges in such a position that they can be taken out of the box by the hand, and inserted into the cartridge without the need of any other device. The boxes are also designed to hold the cartridges in such a position that they can be taken out of the box by the hand, and inserted into the cartridge without the need of any other device.

L. F. BRUCE'S STOP FOR SPRING-LOADED GUNS.

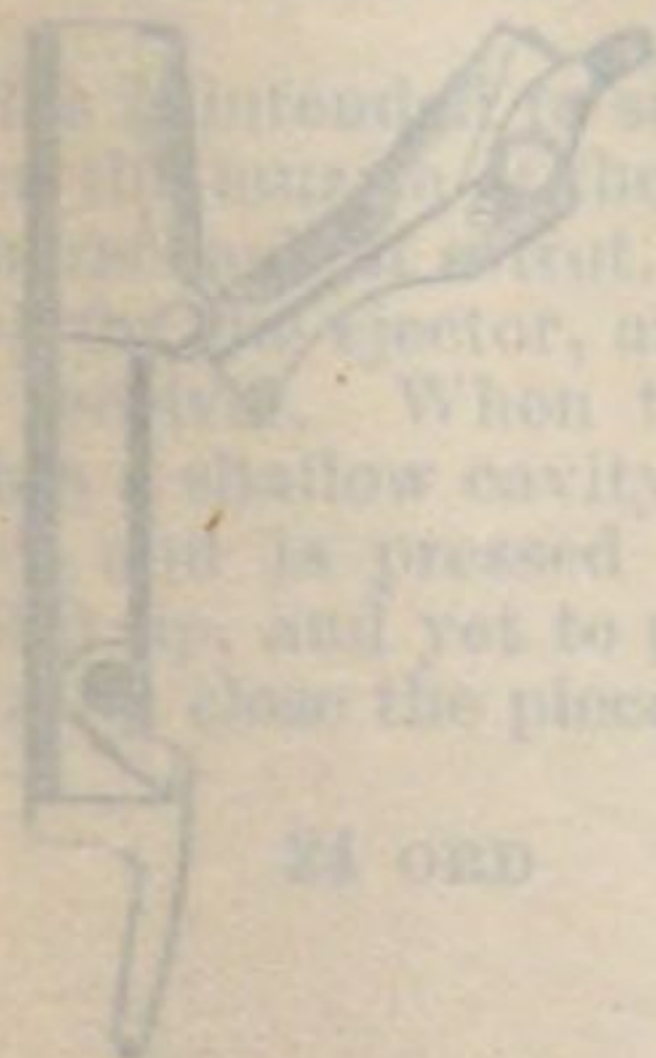


FIG. 1.

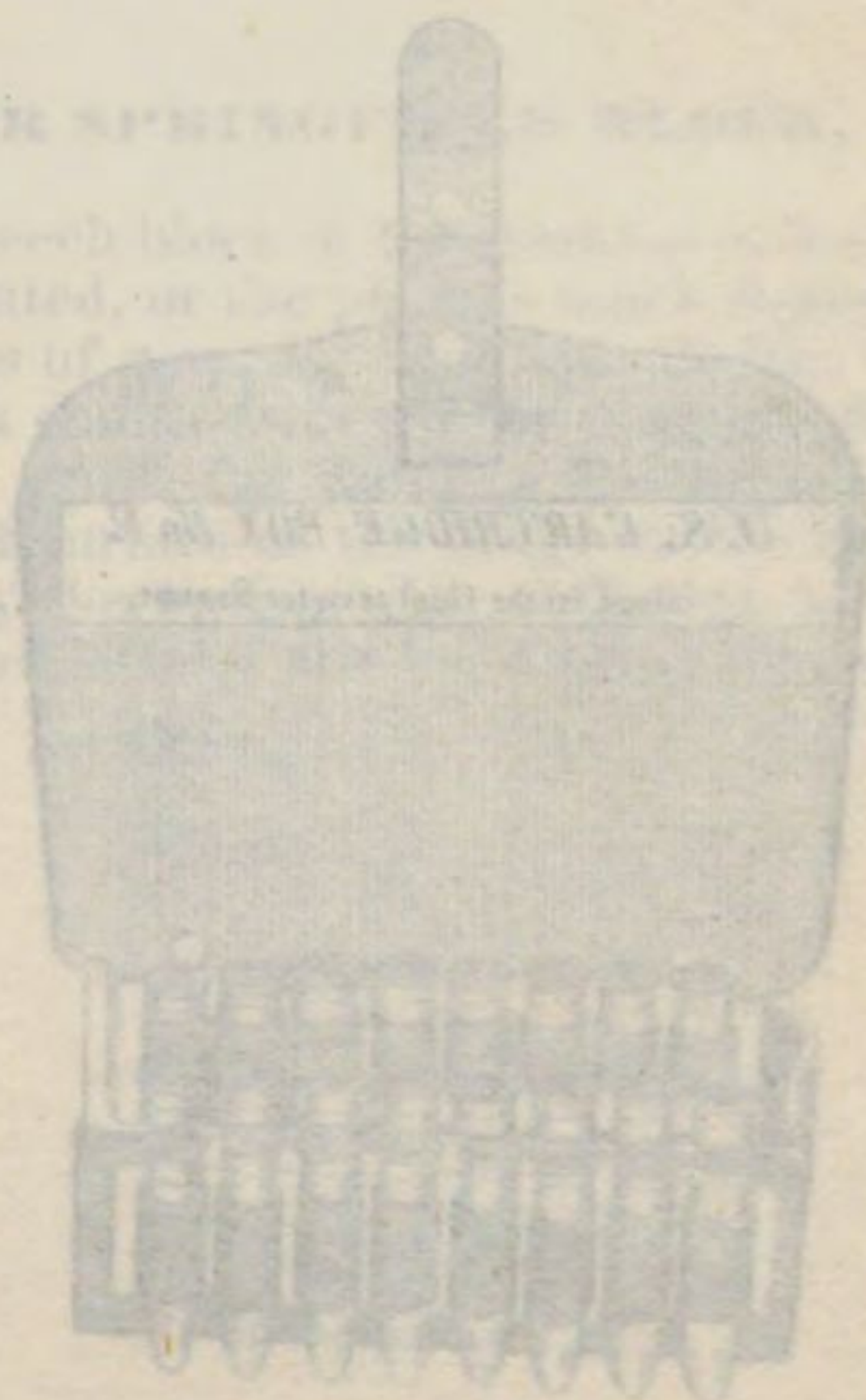
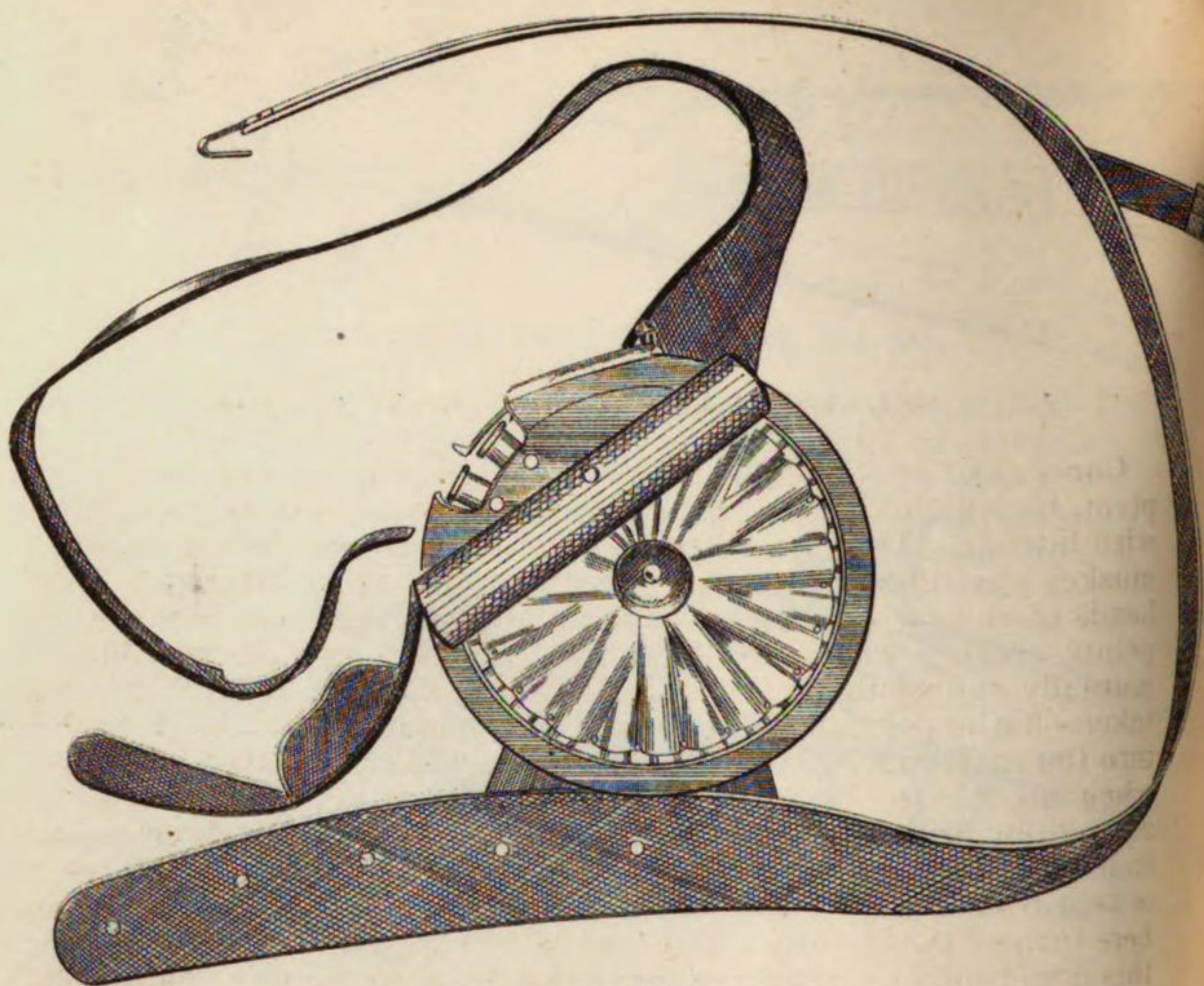
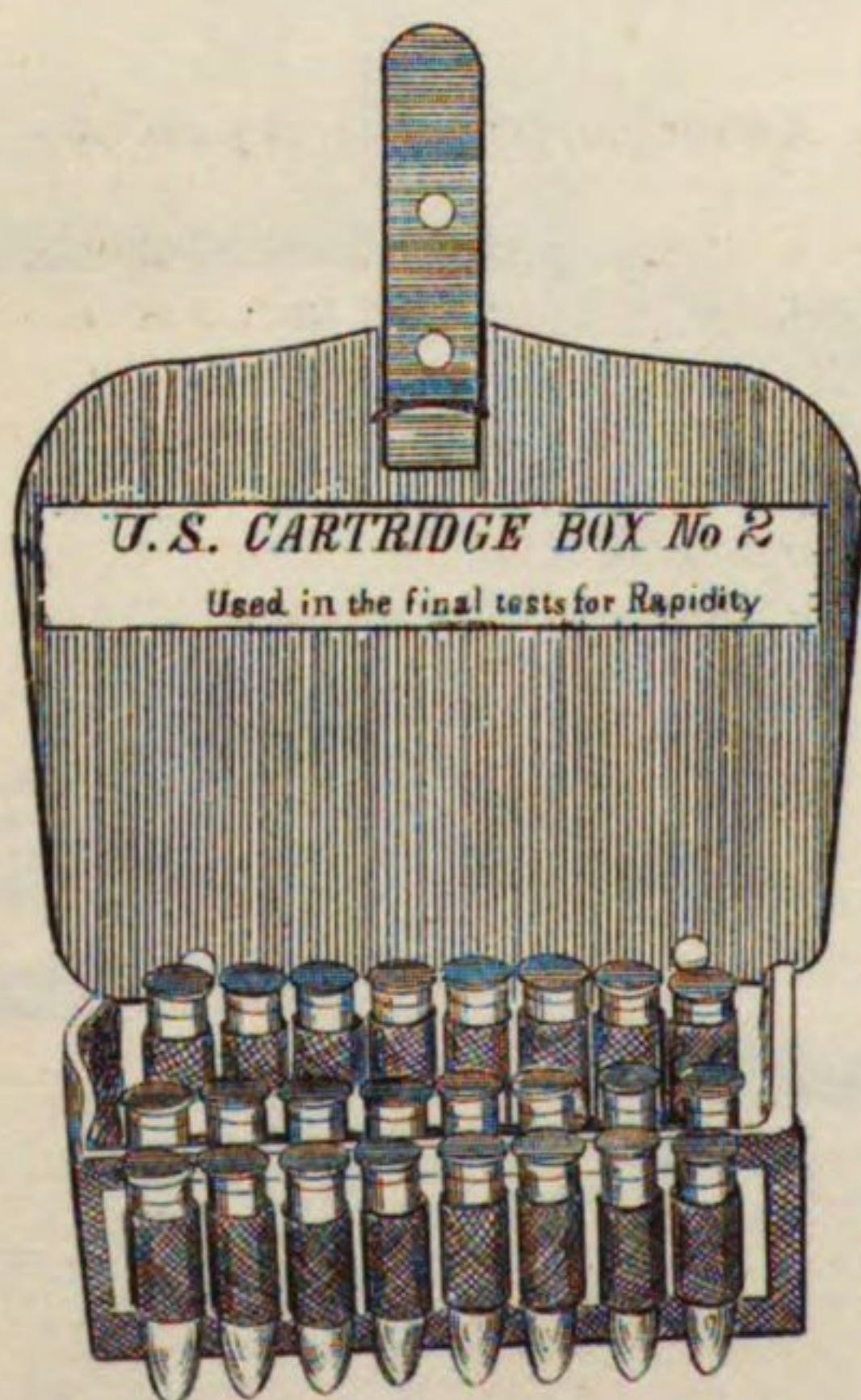


FIG. 2.

STOP FOR SPRING-LOADED GUNS.



100 ELLIOT CARTRIDGE BOX



102 L. F. BRUCE'S
STOP FOR SPRINGFIELD BLOCK.

ELLIOT CARTRIDGE-BOX, No. 100.

Consists of two metallic plates mounted side by side on a common pivot, by which they are secured in a skeleton metallic frame covered with leather. They are fluted radially for the reception of twenty-four musket cartridges, cal. .45. These flutings are so arranged, that the heads of the cartridges may lie in an almost continuous row, while the points overlap each other in such a manner, that the cartridges are mutually supported by the ends of their cases, the weight being thus taken off the point of the ball, and removing its liability to be driven into the cartridge by the repeated shaking of transportation. The box when used is to be worn over the left breast. When charged, it is rotated for firing, by bringing with the fingers each cartridge in succession to an open notch in the periphery of the frame, beyond which it is kept from going by the interposition of the end of the rim, which is here turned down into a flap and serves to stop its further motion in this direction. Its return is prevented by a spring-pawl on the underside of a slide on the circumference of the frame. This slide, when pulled out, as shown in the photograph, keeps the cartridge beneath it from accidentally falling out, and yet allows it to be used as a means of rotating the box, as soon as the cartridge next preceding has been picked out through the space left for its ready removal.

L. F. BRUCE'S STOP FOR SPRINGFIELD BLOCK.

This is intended to sustain the breech-block in the position of loading, when the muzzle of the gun is elevated, or the piece is much shaken, as on horseback at a trot. It consists of a spring and spindle like those used for the ejector, and lying in a counterbore on the opposite side of the receiver. When the block is open, the point of the spindle lies within a shallow cavity in the front surface of the hinge on the breech-block, and is pressed against it by the spring with sufficient force to hold it up, and yet to permit the pressure of the hand properly applied to easily close the piece.

UNITED STATES CARTRIDGE-BOX, No. 2.

The service cartridge-box shown in the preceding view consists essentially of a leather pouch and flap. It is furnished with three rows of eight loops each, intended for the .50 cal. musket cartridge. These loops are made from continuous strips of webbing stiffened with shellac. Two rows of them are within the pouch and one without it, this last being covered by the flap when it is down. The end of the pouch is formed into a shallow pocket for the screw-driver. On its back are two loops through which the waist-belt passes.

MERRILL'S IMPROVED LOCK, No. 72.

A model of a side-lock, intended to dispense with the tumbler and adjacent parts and to be hermetically imbedded in the stock.

A modification of this was also shown in which the motion of the mainspring was arrested by a stop-pin after the hammer in falling had passed the half-cock notch. When applied to the Springfield system the act of raising the firing-pin guard in turning the cam latch to open the block would be sufficient to easily overcome the friction and weight of the hammer and to bring it to the half-cock. In this lock there was no swivel, the mainspring pressing directly on the hammer.

(See photograph among group of assembled arms.)

DESCRIPTIONS OF TROWEL-BAYONETS AND INTRENCHING-TOOLS, AND OF
ACCOMPANYING PORTIONS OF THE EQUIPMENT.

RICE'S TROWEL-BAYONET.

CHILLINGWORTH BAYONET.

MERRILL'S TROWEL-BAYONET HANDLE.

MERRILL'S UPPER BAND.

PROPOSED INTRENCHING-TOOL.

PROPOSED TROWEL-BAYONET.

RICE'S TROWEL-BAYONET, No. 29.

Consists of the ordinary musket-bayonet, the blade of which is shortened and welded to a thin curved triangular plate of steel. It is intended to be used as a trowel for intrenching purposes, being then detached from the musket; the loop connecting the shank and base of the blade serves as a stiffening brace, and also to guard the fingers from abrasion in the act of digging. A similar blade can be affixed to the ordinary sword-bayonet handle, which, though heavier than that first described, affords a more convenient grasp to the hand.

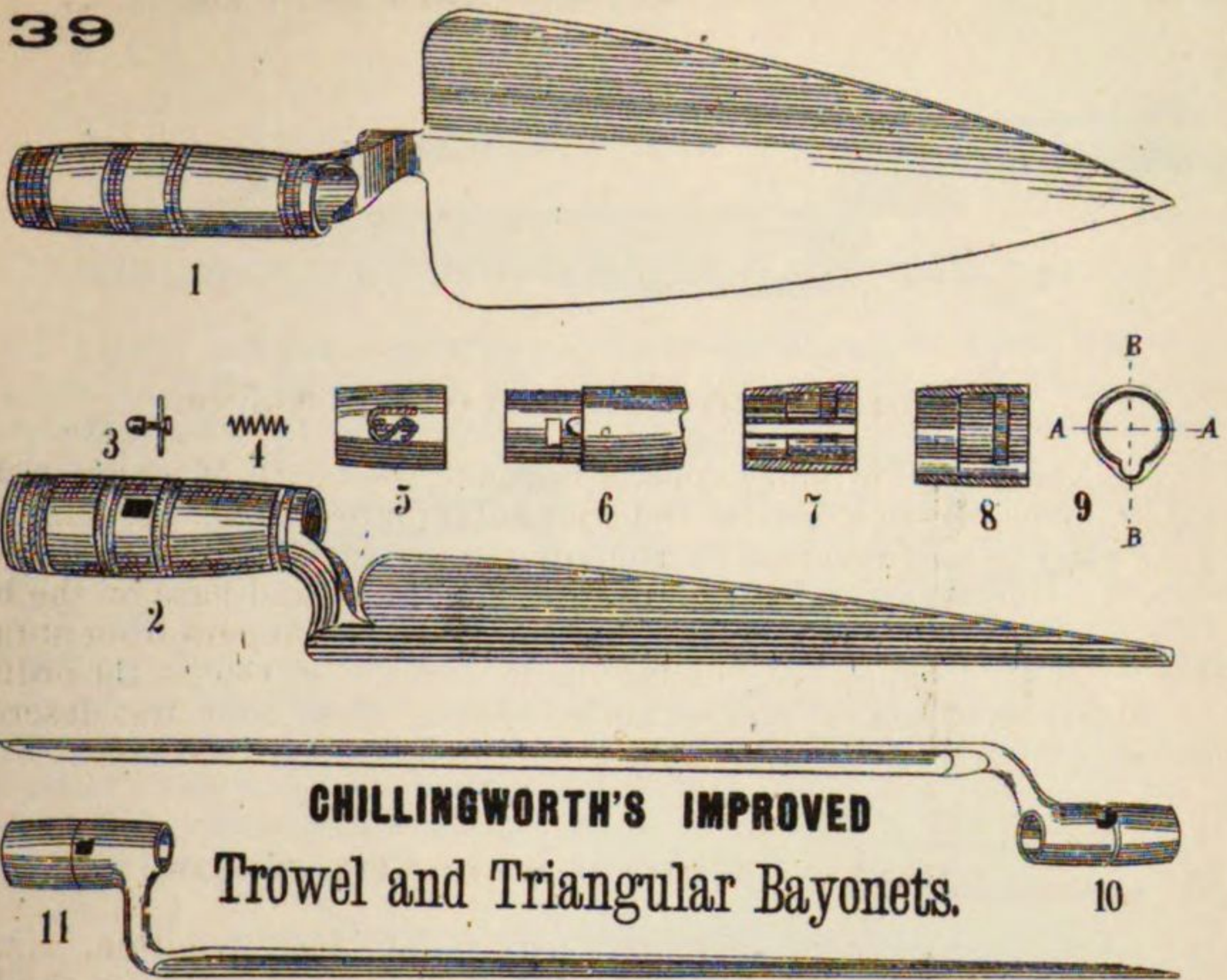
CHILLINGWORTH BAYONET, No. 39.

The peculiarity of the essential feature of this invention, viz, the handle, consists in its affording a more convenient grasp for the hand in digging, or in using it as a side-arm, than does the ordinary bayonet-socket, without materially increasing its weight or losing the advantages of a secure fastening when it is fixed as a pike upon the gun.

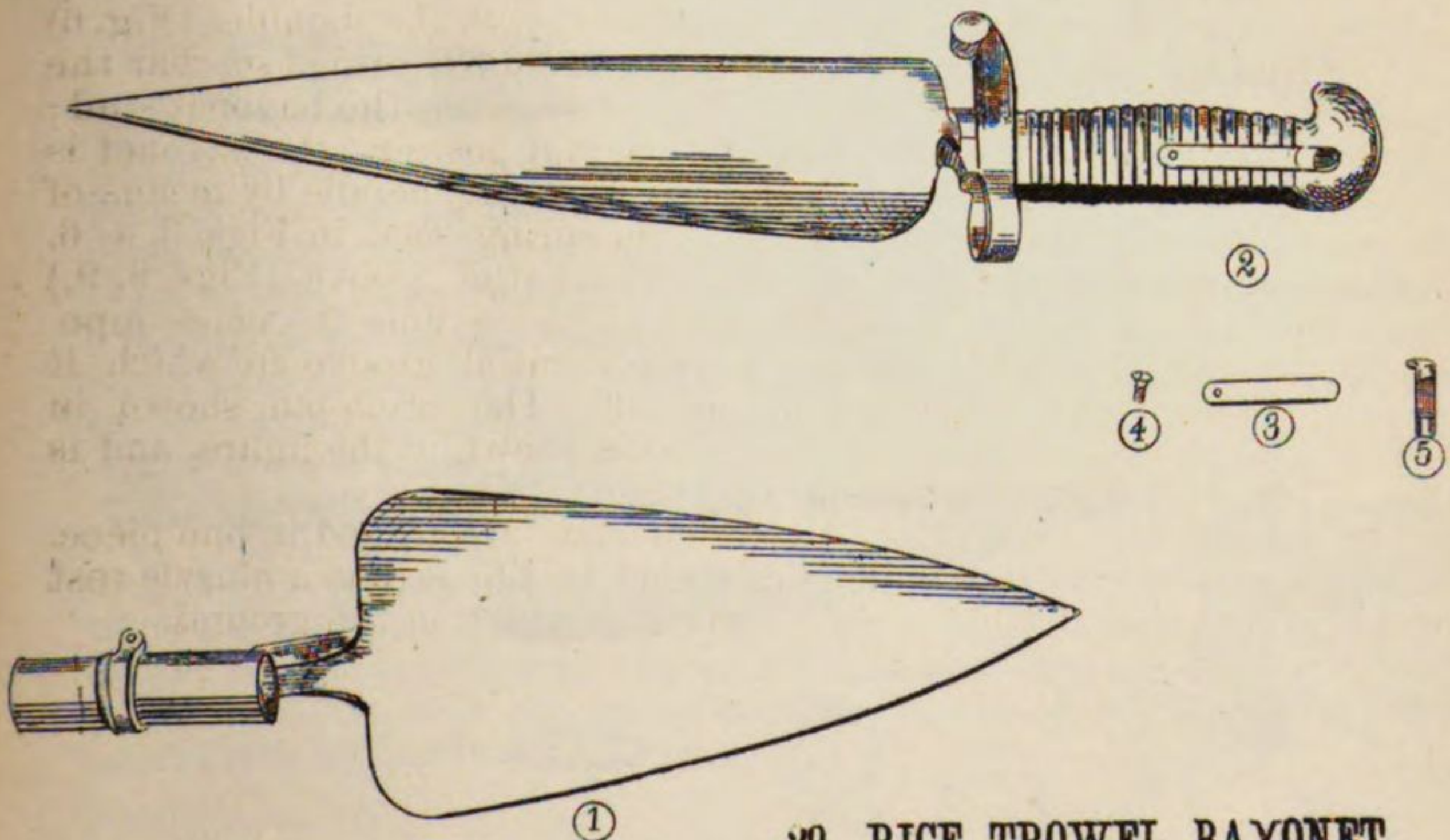
To secure this, beside the general shape of its profile, a shoulder is formed on the rearmost portion of the handle, Fig. 6. To it is fitted a short sleeve, (Figs. 5, 7, 8, 9,) along the bore of which is cut a deep groove, intended to admit the bayonet-stud, (Figs. 8, 9.) When in fixing the bayonet on the musket the bayonet-stud strikes the shoulder (Fig. 6) its longitudinal motion is arrested until the handle is turned so that the square notch (Fig. 2) comes opposite to and receives the bayonet-stud; by then turning back the sleeve to its original position, the bayonet is locked in place. The sleeve is retained upon the handle by means of the stud shown in Fig. 6, and the pin and spring seen in Figs. 3, 4, 6. By pushing back the pin through the bayonet-stud groove, (Figs. 8, 9,) the sleeve may be rotated until the stud which confines it comes opposite to the outlet of the internal circumferential groove in which it travels, the sleeve may then be slipped off. The catch-pin, shown in Fig. 3, is kept in place by a transverse wire, shown in the figure, and is pressed outward by the spiral spring.

The blade and handle of the trowel-bayonet are forged in one piece. The curved neck of the handle is intended to be used as a muzzle-rest in firing, the point of the bayonet being then stuck in the ground.

39

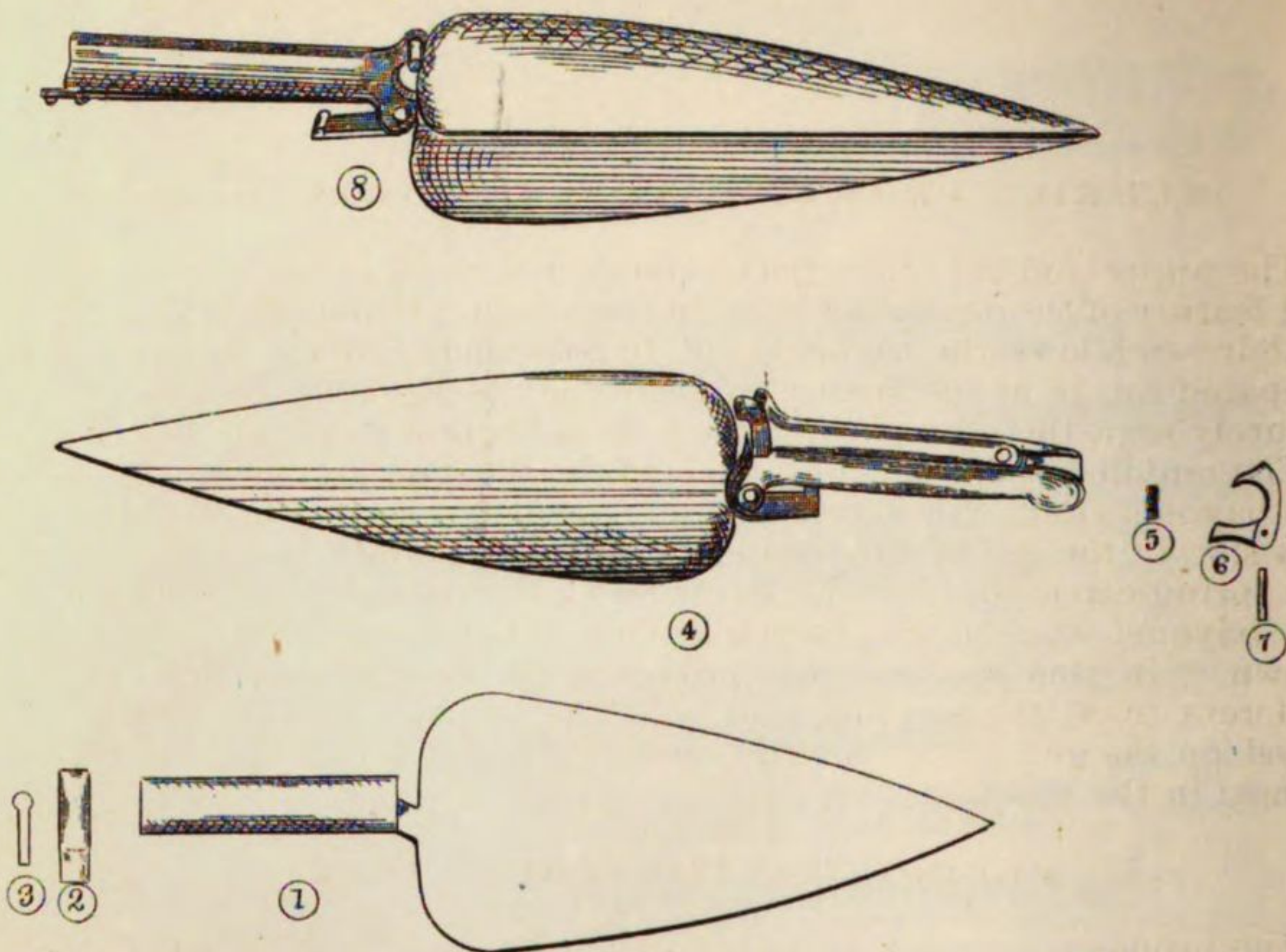


1.—Front view. 2.—Side view. 3.—Socket Friction Pin and Stop. 4.—Socket Friction Pin Spring. 5.—Socket Sleeve. 6.—Socket Arm Stud. 7.—Socket Sleeve, longitudinal section through line A. 8.—Socket sleeve, longitudinal section through line B. 9.—End view of sleeve. 10.—Triangular Bayonet, with sleeve turned to admit the Sight. 11.—Triangular Bayonet, side view.

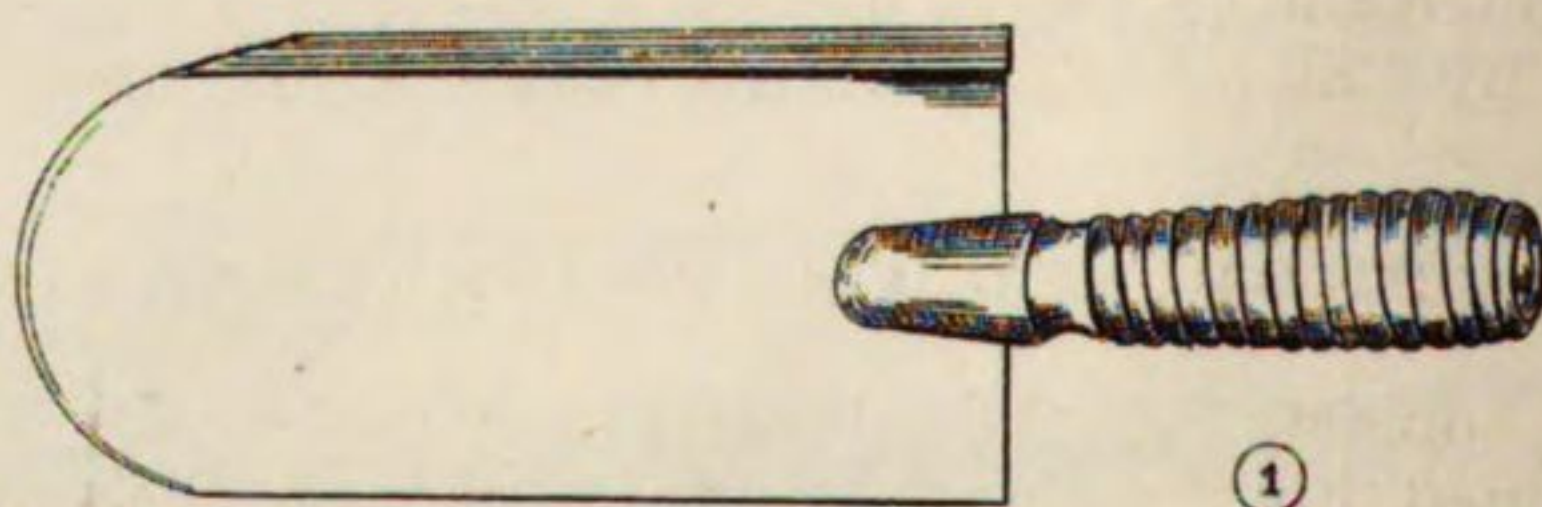


1.—Model '55 Socket and Clasp, with Finger Guard. 2.—Sabre Bayonet Handle. 3.—Sabre Bayonet Handle Spring. 4.—Sabre Bayonet Handle Spring Screw. 5.—Sabre Bayonet Handle Catch.

70 Merrill Trowel Bayonet Handles.

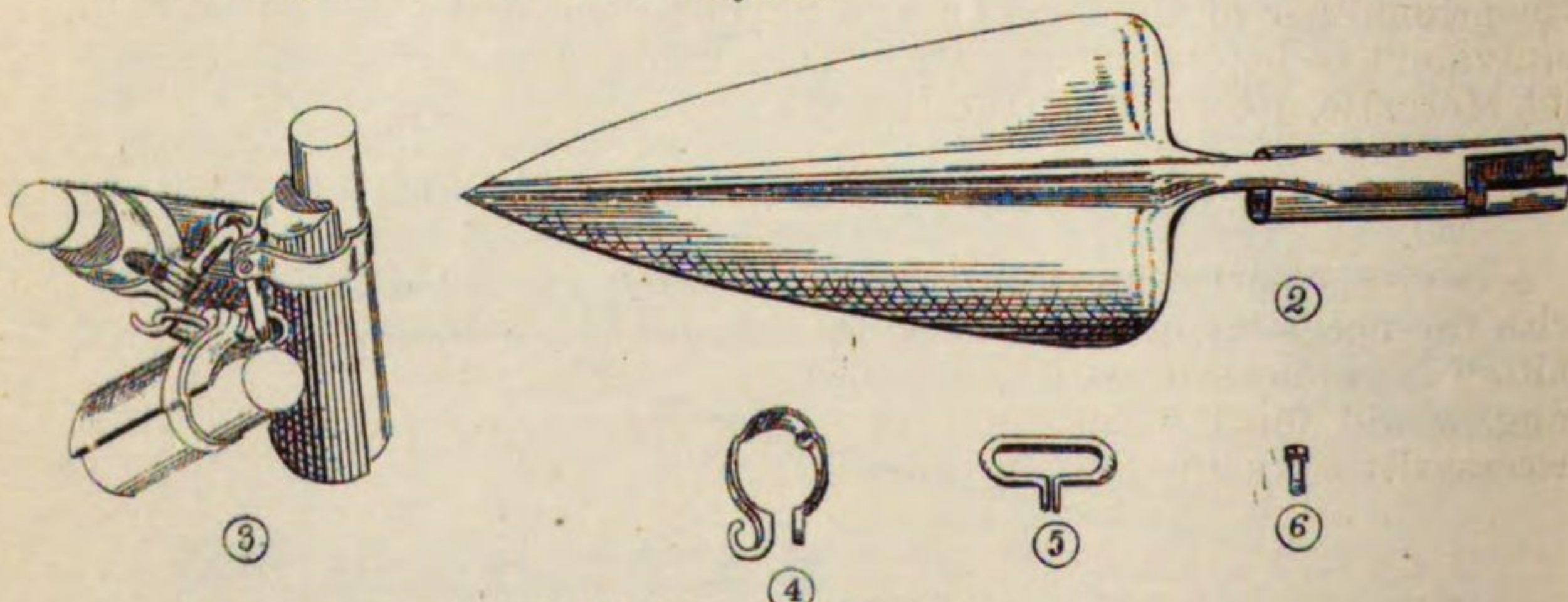


1.—Slide Catch. 2.—Slide. 3.—Friction Spring. 4.—Trowel Bayonet Handle. 5.—Catch Spring. 6.—Catch. 7.—Catch Pin. 8.—Trowel Bayonet Handle.



PROPOSED

Intrenching Tool and Trowel Bayonet.



71 MERRILL UPPER BAND.

1.—Proposed Intrenching Tool. 2.—Proposed Trowel Bayonet Handle. 3.—Upper Band, for stacking arms. 4.—Upper Band. 5.—Upper Band Swivel. 6.—Upper Band Swivel Screw.

MERRILL TROWEL-BAYONET HANDLE, No. 70.

The upper and lower specimens shown differ only in form. The essential feature of the device is a slide in the side of the handle, which being withdrawn allows the bayonet-stud to pass aside into the square notch prepared for it at the farther extremity of its L-shaped groove. It is securely kept there by pushing back the slide into its former position.

The middle specimen shown, is held on the gun by the engaging of the bayonet-stud, with a corresponding notch in a spring-catch swinging in a slot in the end of the handle. By pressing down the outer end of the spring-catch the shoulder on its forward extremity is passed above the bayonet-stud on the barrel, leaving the bayonet free to be withdrawn. In this specimen the groove in the handle is straight, and is undercut to fit the bayonet-stud, and the bayonet is still further secured on the gun by the muzzle passing through a corresponding hole formed in the guard.

PROPOSED INTRENCHING-TOOL.

The proposed intrenching-tool consists of a sheet-steel blade, turned up on one edge and slightly curved cylindrically near the point. It is set in a light wooden handle split for its reception, and securely riveted together through the tang of blade. In one form of the implement the lower edge shown in the illustration was cut into saw-teeth. This tool is intended for exclusive use as a mechanical implement. It was suggested by Colonel Clitz, United States Army, member of the Board.

PROPOSED TROWEL-BAYONET HANDLE.

This consists of the obsolete bayonet-socket 1822 model, slightly lengthened, having the shoulder in front of the bridge filled up and all other corners rounded off smooth to the hand. It is fitted to a trowel-blade of any approved form. It was designed with the belief that the exceptional use of the weapon as a bayonet permitted the clasp or its equivalent to be dispensed with. This model was devised by Lieutenant Metcalfe, Recorder of the Board.

MERRILL UPPER BAND, No. 71.

A device, clearly shown in the photograph, intended for dispensing with the necessity of the triangular bayonet in stacking arms. Submitted in connection with the trowel-bayonet, the use of which in digging, would deprive the muskets of the means of stacking them when necessarily set aside for this purpose.

RECENT ADVANCEMENTS IN THE TREATMENT OF TUBERCULOSIS

The progress and future prospects of the treatment of tuberculosis are discussed in this paper. The author points out that the treatment of this disease has been a subject of much interest and discussion for many years. He reviews the various methods that have been employed, from the use of rest and fresh air to the administration of drugs. He then discusses the recent advances in the treatment of tuberculosis, particularly the use of the new drugs, streptomycin and kanamycin. He points out that these drugs have been found to be very effective in the treatment of tuberculosis, and that they have opened up new possibilities for the treatment of this disease. He concludes by saying that the future of the treatment of tuberculosis is bright, and that we can expect to see many more advances in the years to come.

THE TREATMENT OF TUBERCULOSIS IN THE PAST AND PRESENT

The treatment of tuberculosis has changed greatly in the past few decades. In the past, the treatment of this disease was based on the use of rest and fresh air. Patients were often sent to sanatoriums where they could get plenty of rest and fresh air. However, in the present, the treatment of tuberculosis is based on the use of drugs. The new drugs, streptomycin and kanamycin, have been found to be very effective in the treatment of tuberculosis, and they have opened up new possibilities for the treatment of this disease. The author discusses the various methods that have been employed in the treatment of tuberculosis in the past and present, and he points out the advantages and disadvantages of each method.

THE TREATMENT OF TUBERCULOSIS IN THE FUTURE

The future of the treatment of tuberculosis is bright. We can expect to see many more advances in the years to come. The author discusses the various methods that are being developed for the treatment of tuberculosis, and he points out the advantages and disadvantages of each method. He concludes by saying that the future of the treatment of tuberculosis is bright, and that we can expect to see many more advances in the years to come.

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REPORT
BOARD OF ORDNANCE OFFICERS
SMALL-ARMS CALIBER BOARD.

SMALL-ARMS CALIBER BOARD

REPORT
OF A
BOARD OF ORDNANCE OFFICERS,
CONVENED
UNDER SPECIAL ORDERS No. 107, DATED ADJUTANT GENERAL'S OFFICE, MAY 7, 1872,
FOR THE PURPOSE OF DETERMINING THE
PROPER CALIBER FOR SMALL-ARMS.

APPENDED TO THE REPORT OF THE BOARD FOR THE SELECTION OF A
BREECH-SYSTEM FOR THE MUSKETS AND CARBINES
OF THE MILITARY SERVICE.

REPORT

FIELD OF OBSERVANCE OFFICERS

THESE OFFICERS ARE TO BE

IN THE FIELD OF OBSERVANCE

OF THE FIELD OF OBSERVANCE

PROPER CARE FOR SMALL

THESE OFFICERS ARE TO BE
IN THE FIELD OF OBSERVANCE
OF THE FIELD OF OBSERVANCE

WAR DEPARTMENT, ORDNANCE OFFICE,
Washington, February 6, 1873.

SIR: I have the honor to submit the report and accompanying papers of the Board instituted by S. O. No. 107, A. G. O., 1872, and of which Major J. G. Benton, Ordnance Department, is President, "to conduct a series of experiments with a view to the determination of the proper caliber for small-arms," and to recommend that this report, &c., be submitted to the Board on Small-Arms at Springfield, Massachusetts, of which General A. H. Terry is President, for its consideration and action in connection with the adoption of a breech-loading system for small-arms.

Respectfully, your obedient servant,
By order of the Chief of Ordnance:

S. V. BENÉT,
Major of Ordnance.

The Honorable SECRETARY OF WAR.

[*Indorsement.*]

WAR DEPARTMENT, *February 8, 1873.*

Respectfully referred to the Board in session at Springfield, Massachusetts, of which Brigadier-General A. H. Terry, U. S. A., is President, for its consideration and action in connection with the adoption of a breech-loading system for small-arms.

WM. W. BELKNAP,
Secretary of War.

REPORT.

[Special Orders No. 107.—Extract.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, May 7, 1872.

1. A Board, to consist of Major J. G. Benton, Major T. J. Treadwell, and First Lieutenant William Prince, Ordnance Department, is hereby appointed to meet at Springfield Armory, Springfield, Massachusetts, May 13, 1872, or as soon thereafter as practicable, to conduct a series of experiments, with a view to the determination of the proper caliber for small-arms.

The Board will receive special instructions from the Chief of Ordnance, and make its report to him.

The junior member of the Board will record the proceedings.

By order of the Secretary of War.

E. D. TOWNSEND,
Adjutant General.

Official:

WM. D. WHIPPLE,
Assistant Adjutant General.

NATIONAL ARMORY,
Springfield, Massachusetts, May 14, 1872.

The Board met pursuant to the above order. Present, all the members.

The following letter of special instructions from the Chief of Ordnance was read by the President:

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, May 9, 1872.

SIR: You have received the order convening a Board "to conduct a series of experiments, with a view to the determination of the proper caliber for small-arms."

The Board will submit, for the approval of this Bureau, a programme of such experiments as in its judgment should be made.

As a long range is necessary in making the trials, they will be carried on at the Springfield Armory, where from one thousand yards to a mile range can be readily obtained.

The commanding officers of the Springfield Armory and the Frankford Arsenal will afford every facility and assistance of men, material, instruments, and products, that no delay or interruption may occur. The report should be made to this Bureau, if possible, not later than the 1st of October next. The report should contain not only every detail of the experiments, but a summary of the results, with the conclusions of the Board thereon.

The President of the Board is authorized to call the Board together from time to time, as the experiments require the presence of all the members.

Respectfully, your obedient servant,

By order of Chief of Ordnance:

S. V. BENÉT,
Major of Ordnance.

Major J. G. BENTON,
President of Small-Arms Caliber Board.

The Board then proceeded to examine the records and reports of the various experiments in reference to small-arm caliber heretofore made at the Armory, and at Frankford Arsenal, Philadelphia, and, after mature consideration of the same, recommended the following programme as best calculated to develop the facts necessary for arriving at the decision called for in the order convening the Board:

I. The calibers subjected to comparison with the service-caliber of .50" to be .40", .42", and .45'.

II. The charges in the experiments to range from 65 to 80 grains.

III. The weight of bullets to range from 350 to 450 grains.

IV. The experiments to be directed, primarily, to determining accuracy, and flatness of trajectory; subsequent experiments in other directions to be limited to those calibers and conditions which shall have given satisfactory results in these two particulars.

V. The trial to include a thorough comparison with the performance of the best foreign military small-arms, to effect which the Department to be requested to furnish the Board two specimens of the most recent pattern of the Martini-Henry rifle, as used in the British service, and a similar number of the most recent improved rifles adopted by the French, Prussian, Austrian, and Swiss governments, together with one thousand rounds of ammunition appropriate to each of said arms.

The above programme was submitted to the Chief of Ordnance by the President of the Board in letter of May 16, 1872.

Adjourned.

NATIONAL ARMORY,
Springfield, May 17, 1872.

The Board met at 10 a. m. Present, all the members.

On suggestion of the President it was determined that the experiments on calibers should be prefaced by an investigation in regard to the comparative merits of straight and bottle-shaped cartridge-cases, and the depth to which the bullet should be inserted in the case. The straight cases to be fabricated at Springfield, and the bottle-shaped cases at Frankford Arsenal.

After arranging that experiments with short lap cases, as compared with the usual lap, should be made with straight and bottle-shaped ammunition at the Armory and Arsenal, respectively, during the recess, the Board adjourned to meet at the call of the President.

JULY 4, 1872.

The Board met pursuant to the call of the President. Present, all the members.

The following communication from the Ordnance Office, approving the programme submitted by the Board at its May session, was submitted and filed

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, May 24, 1872.

SIR: I have to acknowledge the receipt of your letter of the 16th instant, embodying the programme for experiments as adopted by the Board, which is approved by this Bureau.

Every effort will be made to procure the arms as required by Par. V. I inclose a list of arms in the museum of this Office, from which you may select such as may be of use pending the procurement of the special arms required.

Very respectfully, your obedient servant,

By order :

S. V. BENÉT,
Major of Ordnance.

Major J. G. BENTON,
President Small-Arms Board.

A report of firing conducted at Springfield Armory, during the recess of the Board, with .40" caliber straight-case ammunition, 350-grain bullet, smooth and *cannelured*, with various charges and systems of lubrication, was submitted.

These experiments had been made pending the construction of a gun chambered for the trial of short-lap ammunition, and are recorded in Appendix A, Table 1, Targets Nos. 1 to 31, inclusive.

A report of firing conducted at Frankford Arsenal, during the recess of the Board, with short-lap .45" caliber bottle-shaped ammunition, as compared with similar ammunition having ordinary lap of case, was submitted, and is recorded in Appendix A, Table 3, Targets 7 to 27, inclusive.

The Board proceeded to the consideration of the experiments at the Armory, and found that, of the systems of lubrication used, that in the *cannelures* gave better results than the greased patch; and that the practice improved as the charge was reduced from 80, through 75 and 70, to 65 grains.

The lubrication with the *cannelured* bullet appearing, however, to be insufficient for accuracy in prolonged firing of 100 or more rounds, it was determined to prepare bullets with deeper *cannelures* (.02" deep) and subject them to trial.

The Board then proceeded to the consideration of the results of trial of short-lap ammunition at Frankford Arsenal, and find that no superiority of accuracy appears to be gained by shortening the hold of the case upon the bullet, while obvious objections exist in respect to the capacity of the ammunition to resist the shocks of transportation and exigencies of service.

As, however, the gun used in the trial had not been especially chambered to derive all the benefit incidental to the exposure of the bullet, final decision as to the desirability of short-lap was deferred until the completion of a gun specially chambered for the purpose.

Adjourned.

JULY 5, 1872.

The Board met pursuant to adjournment. Present, all the members.

A form of chamber for testing short-lap .45" caliber ammunition was determined upon and ordered made. (Gun No. 5, Appendix A.)

The deeply *cannelured* .40" caliber bullet having been prepared as suggested at the last meeting, and made up with 65 grains of powder in straight cases, the Board proceeded to test it for accuracy at 500 yards.

Five targets, without cleaning, gave a mean absolute deviation of 12".5 for the last target, and an average of 12" for the five, with a corrected angle of 58' 55". (Appendix A, Table 1, Targets 32 to 36.)

The service-gun and ammunition on the same occasion gave a mean absolute deviation of 14".8 from five targets.

Five targets with .45" caliber *cannelured* bullet of 440 grains, with 75 grains of powder and bottle-shaped case, prepared at Frankford Arsenal, ordinary lap and lubricated like service, gave a mean absolute deviation of 10".5, with a corrected angle of 1° 5' 40". (Appendix A, Table 3, Targets 2 to 6, inclusive.)

NOTE.—The above firings were, in reality, executed on the 5th and 6th of July, the guns being left fouled over night.

Adjourned.

JULY 6, 1872.

The Board met pursuant to adjournment. Present, all the members.

The firing, described as commenced on the 5th instant, was completed, with the results as stated.

The President stated that the .42" caliber straight-chambered rifle, 18" twist, would be ready for trial on Monday, the 8th instant, with ammunition consisting of 370-grained *cannelured* bullet, and charges of 70, 75, and 80 grains musket-powder. Also, that a .45" caliber straight-chambered rifle was in course of preparation.

It was resolved that the reports of the experiments with bottle-shaped cartridges for .42" and .45" calibers, made at Frankford Arsenal, and submitted at the first session of the Board, be adopted as part of the record of that kind of ammunition in comparison with the straight chambers and ammunition now being fabricated for trial by the Board.

These reports, with their accompanying records, will, accordingly, be found in Appendix B.

Adjourned.

JULY 8, 1872.

The Board met pursuant to adjournment. Present, Major J. G. Benton and Lieutenant William Prince.

The Board proceeded to the trial of the .42" caliber straight-chambered rifle, described at the last meeting; twist, 18 inches. (Appendix A, Gun No. 4.)

Straight-case cartridges, with charges of 70, 75, and 80 grains of musket-powder, and a cylindro-ellipsoidal, *cannelured* bullet of 370 grains, lubricated only in the *cannelures*, were fired from this rifle at 500 yards—one target of 20 shots with each charge—the gun being cleaned after each target. (Appendix A, Table 2, Targets Nos. 1, 2, and 3.)

The lightest charge gave the best results, as heretofore found with the .40" caliber, the 80-grain charge going quite wild after the first few shots. The whole trial indicated insufficient lubrication, the earlier shots in each target being good, and the practice rapidly deteriorating.

It was, accordingly, determined to fabricate a few cartridges with the bullets more deeply *cannelured*, and with 70-grain charges, for trial at the next meeting of the Board.

Adjourned.

JULY 9, 1872.

The Board met pursuant to adjournment. Present, Major J. G. Benton and Lieutenant William Prince.

The .42" caliber cartridges with deeply *cannelured* bullets having been prepared as ordered, a target of 20 shots was fired at 500-yard range. (Appendix A, Table 2, Target No. 4.)

The results indicated a much-improved practice, with a mean absolute deviation of only 9".26, and the gun apparently quite clean at the termination of the trial. Only a moderate number of these cartridges having been prepared, the trial was discontinued for the time, a sufficient number being ordered to make a full trial of their efficiency in protracted firing at a subsequent occasion.

The President stated the .45" caliber straight-case rifle and ammunition would soon be ready for trial, together with a new series of .40", .42", and .45" caliber rifles, with barrels lightened by reducing the walls to the thickness of those of the present Springfield rifle.

It was resolved that all trials for accuracy and trajectory should be limited to 500-yard range, until the experiments had narrowed the field down to two or three varieties of ammunition or rifling, when trials at 800 and 1,050-yard range should be made to complete the record.

It was resolved that the .45" caliber rifle for testing short-lap ammunition, chambered as suggested at the meeting of July 4, and ordered at meeting of July 5, be sent to Frankford Arsenal on completion; and that further trial of short-lap ammunition be made at that post and reported at the next session of the Board.

It was also resolved that, where time could be saved and the business of the Board facilitated by trials of proposed guns and ammunition at Frankford Arsenal between sessions of the Board, such trials should be so made, and reported at the next subsequent session; the President to send to Frankford Arsenal such of the proposed guns and cartridges as he deemed could be best tested with the facilities at that post.

The Board then adjourned to convene again at the call of the President.

NATIONAL ARMORY,
Springfield, Massachusetts, November 28, 1872.

The Board met pursuant to call of the President. Present, all the members.

Experimental firing, in accordance with the resolution of the Board, had been progressing at the National Armory since the last meeting, under direction of the President of the Board, assisted during a portion of the interval by the junior member.

The President stated that the following foreign arms and ammunition had been received in response to the request contained in the programme forwarded to the Ordnance Office May 16, 1872. (Folio 352.)

Two Martini-Henry rifle-muskets, with a supply of complete cartridges.

One Vetterlin (Swiss) rifle-musket, with complete cartridges.

One Werndl (Austrian) rifle-musket, with primed cases and bullets.

One Needle (Prussian) rifle-musket, with primed sabots.

One Beaumont (Dutch) rifle-musket, with complete ammunition.

Two Berdan (Russian) guns, with ammunition, were already available by the Board.

The absence of a French arm and Prussian ammunition, were accounted for by the fact that France has at present no distinctively national arm, and that Prussian ammunition is in a transition state from the paper sub-caliber cartridge formerly used to metallic ammunition for a different breech-loader.

These arms and cartridges are described in Appendix A, under the following numbers:

RIFLES.

Martini-Henry, (English,) No. 17.

Vetterlin, (Swiss,) No. 18.

Werndl, (Austrian,) No. 19.

Needle, (Prussian,) not tested.

Beaumont, (Dutch,) No. 6.

Berdan, (Russian,) No. 7.

CARTRIDGES.

Martini-Henry, (English,) No. 51.

Vetterlin, (Swiss,) No. 52.

Werndl, (Austrian,) No. 53.

Beaumont, (Dutch,) No. 31.

Berdan, (Russian,) No. 32.

The Board proceeded to the consideration of the performance of such of the foreign arms and cartridges as had been tested during the interval since their last session, and found none of them worthy of further trial in comparison with the experimental calibers under investigation, except the Martini-Henry and the Russian-Berdan. Their mean absolute deviations at 500 yards were as follows:

Martini-Henry, 10".3, (Appendix A, Table 3, Nos. 68 to 72.)
 Russian-Berdan, 12".8, (Appendix A, Table 2, Nos. 5 to 12.)
 Beaumont, (Dutch,) 16".4, (Appendix A, Table 3, Nos. 32 to 44.)
 Vetterlin, (Swiss,) 22".6, (Appendix A, Table 2, Nos. 41 to 45.)
 Werndl, (Austrian,) wild, (Appendix A, Table 2, Nos. 46 to 50.)
 Adjourned.

NATIONAL ARMORY,
Springfield, Massachusetts, November 29, 1872.

The Board met at 9 a. m., pursuant to adjournment, and proceeded to consider the records of various modifications of the .40", .42", and .45" caliber barrels made during the intermission.

In the .40" caliber the following firings were submitted:

1st. Trials of three different lengths of the straight-case cartridge with 340-grain bullet and 65-grain charge, the case covering three, four, and five *cannelures* of the bullet, respectively, as described under Nos. 44, 45, and 46, (Appendix A, Descriptions of Ammunition,) the object being to get as short a .40" caliber cartridge as possible, consistently with good practice and a charge of 65 grains. These cartridges were tried in 18" twist barrels, with throats shortened proportionately to the shortened cartridges, and the barrels lightened by reducing their walls to thickness of the service .50" caliber rifles.

The barrels are described in Appendix A, under Nos. 9, 13, and 14, "Descriptions of Arms."

Gun No. 9, with a full length chamber and lightened barrel, gave, with the shortened cartridge, a mean absolute deviation of 16".7 from three targets. (Appendix A, Table 1, Targets Nos. 50 to 52.)

Gun No. 14, with medium length chamber and medium cartridge, gave 19".8 from five targets. (Appendix A, Table 1, Nos. 58 to 62.)

Gun No. 13, with short chamber and short cartridge, gave 10".4 from five targets. (Appendix A, Table 1, Nos. 53 to 57.)

The last gun, (No. 13,) with its ammunition, (No. 46,) was selected as the representative gun and cartridge of this caliber.

Its trajectory for 1,050 yards and intermediate ranges was presented as constructed from firings at every hundred yards, from one hundred to one thousand.

The firings for the angles of elevation, required to construct this trajectory, had been executed from the shoulder to avoid the complications produced by the strains and vibrations of a fixed rest.

It was resolved that these angles should stand on the record as those of this gun and cartridge. They were as follows:

	Angle of sight.
For 100 yards	2' 40"
For 200 yards	13' 45"
For 300 yards	27' 8"
For 400 yards	37' 43"
For 500 yards	56' 20"
For 600 yards	1° 15' 26"

	Angle of sight.
For 700 yards	1° 32' 8"
For 800 yards	1° 53' 8"
For 900 yards	2° 11' 22"
For 1,000 yards	2° 37' 6"

The mean absolute deviations at long ranges for this caliber were found to be—

For 800 yards, 24".5.

For 1,050 yards, 49".0.

(Appendix A, Table 1, Targets Nos. 82, 83, 88, 89, and 90.)

Initial velocity, 1,387.7 feet per second.

Pressure 19,900 pounds per $\square$ ".

(Appendix A, Table 5, Nos. 21 to 30.)

Penetration in pine boards at 500 yards, average of ten shots, 8".
(Appendix A, Table 6, No. 1.)

In connection with this caliber (.40") a barrel, rifled on the Henry principle of the Martini-Henry rifle, had been constructed and tested with full-length .40" caliber cartridges. This gun is described as No. 12 in Appendix A, "Descriptions of Arms." Its performance, though fair, did not indicate any superiority over that of the three plain grooves of the other barrels. The mean absolute deviation at 500 yards was 13".1, as derived from seven targets. (Appendix A, Table 1, Nos. 37 to 43.)

It was resolved to give a final trial to this caliber as exemplified in gun No. 13 and cartridge No. 46, they being the best .40" caliber forms developed by the trials, and 200 more cartridges were accordingly ordered.

Adjourned.

NATIONAL ARMORY,
Springfield, Massachusetts, November 30, 1872.

The Board met, pursuant to adjournment, at 9 a. m., and proceeded to the consideration of the records of the .42" caliber trials.

In this caliber the following firings were submitted:

Conformably with resolution of July 9 in reference to further trial of more deeply *cannelured* bullets, four targets had been fired on the 11th of July with such bullets and charges of 60, 65, 75, and 80 grains, with steadily decreasing accuracy as the charge was increased. The mean absolute deviations at 500 yards were as follows:

60-grain charge, 6".9, (Appendix A, Table 2, No. 16.)

65-grain charge, 9".07, (Appendix A, Table 2, No. 13.)

75 grain charge, 19".2, (Appendix A, Table 2, No. 14.)

80-grain charge, 26".5, and 3 misses. (Appendix A, Table 2, No. 15.)

The elevation required for the smallest charge, however, was greater than was deemed admissible, and further trials were confined to 65-grain charges. Of these a series of five targets were fired July 18, with a mean absolute deviation at 500 yards of 9".96. (Appendix A, Table 2, Nos. 17 to 21.)

Another series of five targets, with a lightened barrel and longer twist, (20"), was fired, August 31, with a mean absolute deviation at 500 yards of 13".8. (Appendix A, Table 2, Nos. 22 to 26.)

Another series of five targets, with the same gun as the last, the cartridges shortened .1" by deeper insertion of the bullet, was fired, September 9, with a mean absolute deviation of 12".1. (Appendix A, Table 2, Nos. 27 to 31.)

Subsequent experiments with cartridges still further shortened and a gun with chamber shortened to correspond were conducted, during September and October, and gave a mean absolute deviation at 500 yards of 14''.6. (Appendix A, Table 2, Nos. 32 to 40.)

The angles of sight for various ranges, as determined by shoulder-firing for the purpose of constructing a trajectory, were as follows:

	Angles of sight.
For 100 yards.....	10' 6''
For 200 yards.....	21' 54''
For 300 yards.....	34' 4''
For 400 yards.....	53' 32''
For 500 yards.....	1° 8' 8''
For 600 yards.....	1° 26' 23''
For 700 yards.....	1° 47' 3''
For 800 yards.....	2° 7' 43''
For 900 yards.....	2° 34' 27''
For 1,000 yards.....	3° 6' 20''

The mean absolute deviations for long ranges were found to be as follows:

For 800 yards, 22''. (Appendix A, Table 2, No. 69.)

For 1,050 yards, 44''.6. (Appendix A, Table 2, Nos. 72 to 75.)

Initial velocity, 1,312.5 feet per second. (Appendix A, Table 5, Nos. 11 to 20.)

Pressure, 16,250 pounds per $\square''$. (Appendix A, Table 5, Nos. 11 to 20.)

Penetration in pine boards at 500 yards, average of 10 shots, 8''.55. Appendix A, Table 6, No. 2.)

A diagram of the trajectory, founded upon the above angles, was submitted as in the case of the .40'' caliber.

As, however, the convexity of the trajectory and the angles of elevation somewhat exceeded the limits that were deemed desirable, some targets were fired with charges of 70 and 75 grains in comparison with 65 grains.

The former trials with these heavier charges having been confined to bullets with shallow *cannelures* and consequent inadequate lubrication, it was hoped that, with the deeply-grooved bullet, the increase of charge might be unattended by the deterioration of practice heretofore experienced, while at the same time flattening the trajectory.

The results were as follows, from three targets at 500 yards, fired with 65, 70, and 75 grain charges, respectively:

	M. Abs. Dev.	Angle of sight.
65-grain charge.....	10''.0	1° 13' 38''
70-grain charge.....	16''.9	1° 7' 38''
75-grain charge.....	20''.1	1° 5' 28''

(Appendix A, Table 2, Nos. 51 to 53.)

With the hope that an increased length of twist might enable the 70-grain charge to give a better mean absolute deviation, a barrel, (No. 20, "Descriptions of Arms,") was prepared, similar in all respects to the one last used, (No. 15,) except the twist, which was lengthened from 20'' to

24". A series of five targets from this barrel gave a mean absolute deviation of 12".8, with an angle of sight of $1^{\circ} 4' 7'$. (Appendix A, Table 2, Nos. 54 to 58.)

It was resolved to give a final trial to this caliber, as exemplified in gun No. 20 and cartridge No. 54, those being the best 42' caliber forms developed by the trials, and 200 more cartridges were accordingly ordered.

Adjourned.

NATIONAL ARMORY,
Springfield, Massachusetts, December 2, 1872.

The Board met at 9 a. m., pursuant to adjournment, and proceeded to consider the records of .45" caliber experiments made during the intermission.

Under this caliber the Board considered the performance of the following forms of barrels and ammunition.

With bottle-shaped cartridges, a series of four targets, at 500 yards, with short-lap ammunition, (No. 29,) had been fired at Frankford Arsenal, with a gun (No. 5) chambered specially for such cartridges, as directed at the last meeting of the Board, (July 9, 1872,) with the following results:

Mean absolute deviation, 12".0; corrected angle of sight, $1^{\circ} 2' 50''$. (Appendix A, Table 3, Nos. 28 to 31.)

With straight-case cartridges a series of firings had been made at Springfield Armory with an 18" twist barrel, (No. 8,) to determine the best weight of charge for this caliber, with the following results as regards accuracy:

Mean absolute deviation at 500 yards:

60-grain charge.....	12".7
65-grain charge.....	11".3
70-grain charge.....	9".9
75-grain charge.....	13".1
80-grain charge.....	12".1

(Appendix A, Table 3, Nos. 45 to 49.)

The 65 and 70 grain charges appearing to give the best results, a series of four targets with each was subsequently fired, with the following mean absolute deviations at 500 yards:

65-grain charge, (No. 39).....	12".2
70-grain charge, (No. 40).....	12".4

(Appendix A, Table 3, Nos. 50 to 57.)

The performance being so nearly equal, the stronger charge was selected for further trials.

A reduction in length of the cartridge was tried, as in case of the smaller calibers, by inserting the bullet to a depth which would cover all the *cannelures*, reducing the length by .1". (Ammunition No. 47 Appendix A.)

A series of five targets, with this ammunition, was fired from a gun (No. 11, Appendix A) suitably chambered and with a 22" twist, with the following mean absolute deviation at 500 yards: 11".1. (Appendix A, Table 3, Nos. 58 to 62.)

It being found that the ammunition could sustain still further shortening, without undue compression of the charge, a cartridge (No. 50, Appendix A) was prepared, having not only the bullet inserted to cover

all the *cannelures*, but the case itself shortened a further .2'', making the total length of the cartridge 2''.5.

A series of five targets was fired with this ammunition from a gun (No. 16, Appendix A) suitably chambered and with a 22'' twist, with the following mean absolute deviation at 500 yards: 10''.6. (Appendix A, Table 3, Nos. 63 to 67.)

A trajectory of this latter ammunition was submitted which had been constructed from the following angles of sight, obtained for every 100 yards up to 1,000, by firing from the shoulder and rest, as in the previous calibers:

	Angles of sight.
100 yards.....	17' 17''
200 yards.....	24' 6''
300 yards.....	38' 56''
400 yards.....	54' 45''
500 yards.....	1° 12' 31''
600 yards.....	1° 26' 23''
700 yards.....	1° 46' 34''
800 yards.....	2° 4' 4''
900 yards.....	2° 32' 1''
1,000 yards.....	3° 2' 14''

The mean absolute deviations for long ranges were as follows:

For 800 yards, 24''.2. (Appendix A, Table 3, No. 103.)

For 1,050 yards, 57''.0. (Appendix A, Table 3, No. 114.)

Initial velocity, 1,300'.2 per second; pressure 16,300 pounds per $\square''$. (Appendix A, Table 5, Nos. 31 to 40.)

Penetration in pine boards at 500 yards, average of 10 shots, 6''.8. (Appendix A, Table 6, No. 3.)

In regard to short-lap cases the Board was of the opinion that no superiority was exhibited which would compensate for the objectionable features incident to that mode of constructing a cartridge, and that the aggregate records indicate the general superiority of straight over bottle shaped cases and chambers.

It was resolved to give a final trial to caliber .45'', as exemplified in gun No. 16 and cartridge No. 50, those being the best .45'' caliber forms developed by the trials, and 200 more cartridges were accordingly ordered.

In the matter of .50'' caliber service-cartridges, many targets had been fired, in the course of experiments on smaller calibers, which corroborated in their general average the figures contained in the official pamphlet on that gun, made up from the results of many thousand rounds fired at the National Armory.

It was accordingly resolved that the figures of that record be used for purposes of comparison, as being founded on a much more extended basis of facts than the Board could possibly accumulate.

These figures are as follows:

Mean absolute deviation at 500 yards, 13''.1.

	Angles of sight.
100 yards.....	18' 00''
200 yards.....	30' 00''
300 yards.....	48' 29''
500 yards.....	1° 19' 56''
700 yards.....	2° 19' 48''
900 yards.....	3° 00' 00''
1,000 yards.....	4° 00' 00''

Mean absolute deviations for long ranges.

700 yards	9".22
1,050 yards	32".07

Initial velocity, 1,240 feet per second.

Pressure, 12,000 pounds per $\square''$.

Penetration at 500 yards, in white-pine boards, 8".5.

As might be expected from the weight of the bullet (450 grains) the trajectory of the service-cartridge is much more convex than any of the small-caliber cartridges tried.

Adjourned.

NATIONAL ARMORY,

Springfield, Massachusetts, December 3, 1872.

The Board met at 9 a. m., pursuant to adjournment. Present, all the members.

A series of five targets, each at 500 yards, had been fired from the two foreign arms which had been selected for comparison at the meeting of November 28, viz, the "Martini-Henry" and the "Russian-Berdan."

The results were as follows, fired in perfect calm :

"Martini-Henry," (English,) caliber .45": mean absolute deviation, 9".1; corrected angle of sight, $1^{\circ} 8' 9''$. (Appendix A, Table 3, Targets Nos. 73 to 77.)

"Russian-Berdan," caliber .42": mean absolute deviation, 14".9; corrected angle of sight, $59' 57''$. (Appendix A, Table 2, Targets Nos. 64 to 68.)

A series of five shots, with the .42" caliber ammunition, (No. 54,) ordered for final trial in gun No. 20, at meeting of November 30, had also been fired December 3, and gave the following results at 500 yards :

Mean absolute deviation, 12".9; corrected angle of sight, $1^{\circ} 4' 5''$. (Appendix A, Table 2, Targets Nos. 59 to 63.)

The successive targets of Russian-Berdan indicated defective lubrication as in previous trials.

The President of the Board stated that he was ordered on special duty at Boston, which would require him to leave for that city to-day.

It was accordingly resolved that the results of the two calibers remaining for final trial should be communicated to the other members of the Board by mail, when, if no anomalous features were developed, the Board would be in a condition to report.

Adjourned.

FRANKFORD ARSENAL, *December 12, 1872.*

The President submitted to the Board the results of firing a series of five targets at 500 yards with the .40" caliber gun (No. 13) and ammunition, (No. 46,) they being the forms selected for final trial as the best of their caliber, at meeting of November 29, 1872.

These targets were fired December 4, 1872, with the following results :

Mean absolute deviation, 15".7; corrected angle of sight, $59' 55''$. Wind strong from left rear. (Appendix A, Table 1, Nos. 67 to 71.)

A series of five targets at 500 yards had also been fired with the .45" caliber gun No. 16 and ammunition No. 50, they being the forms selected for final trial as the best of their caliber at meeting of December 2, 1872. The results submitted by the President were as follows:

Mean absolute deviation, 13".7; corrected angle of sight, 1° 5' 16". Wind stiff to light from right rear. (Appendix A, Table 3, Nos. 78 to 82.)

A target of twenty shots had been fired at 800 yards, with each of the following guns and cartridges:

Results as follows—day calm:

Cal. .45", gun No. 16, cartridge No. 50. Mean absolute deviation, 26".5, and 1 miss; corrected angle of sight, 2° 31' 27". (Appendix A, Table 3, No. 104.)

Cal. .45" Martini-Henry gun and ammunition: Mean absolute deviation, 24".2 and 3 misses; corrected angle of sight, 2° 24' 39". (Appendix A, Table 3, No. 105.)

Cal. .42", gun No. 20, cartridge No. 54: Mean absolute deviation, 21".8 and 2 misses; corrected angle of sight, 2° 11' 15". (Appendix A, Table 2, No. 70.)

Cal. .42", Russian-Berdan gun and ammunition: Mean absolute deviation, 26".7 and 7 misses; corrected angle of sight, 2° 7' 3". (Appendix A, Table 2, No. 71.)

Cal. .40", gun No. 13, cartridge No. 46: Mean absolute deviation, 32".2 and 7 misses; corrected angle of sight, 2° 7' 5". (Appendix A, Table 1, No. 84.)

It having been determined that the bullet of the .45" caliber cartridge should be hardened with one-thirteenth its weight of tin, in order to equalize the conditions between itself and the Martini-Henry bullet of the same caliber, the Board awaited the result of a series of targets with such bullet, the President stating that the ammunition was ready for trial.

FRANKFORD ARSENAL, *December 14, 1872.*

The President submitted to the Board the results of firing a series of five targets at 500 yards with .45"-caliber gun No. 16 and ammunition No. 58, the bullet hardened with one-thirteenth tin.

These targets were fired December 12, 1872, results as follows:

Mean absolute deviation, 8".8; corrected angle of sight, 59' 59"; wind strong from left front, variable in direction and intensity. (Appendix A, Table 3, Nos. 83 to 87.)

This practice, the best on record of five targets without cleaning, was made in a strong and changeable wind, and left the gun very clean after 103 shots.

On the 13th of December the same gun, No. 16, and same ammunition, No. 58, were fired a target of twenty shots at 800 yards. The "Martini-Henry" being fired immediately after, the results communicated by the President were as follows:

.45" caliber gun No. 16, cartridge No. 58: Mean absolute deviation, 23".0; corrected angle of sight, 2° 27' 16". Wind light from rear. (Appendix A, Table 3, No. 107.)

.45" caliber Martini-Henry gun and ammunition: Mean absolute deviation, 20".5; corrected angle of sight, 2° 27' 38". Wind light from left rear. (Appendix A, Table 3, No. 106.)

FRANKFORD ARSENAL, *December 19, 1872.*

The President submitted to the Board the following results of firing at 1,050 yards with .45'' caliber gun No. 16 and ammunition No. 58, hardened bullet, in comparison with the Martini-Henry and Russian-Berdan, one target of twenty shots with each fired from shoulder and rest; wind—calm :

Guns and ammunition.	Mean deviation.	Angle of sight.	Misses.
.45'' caliber, hardened	35'' .2	3° 34' 15''	0
Martini-Henry	33'' .7	3° 26' 43''	4
Russian-Berdan	73'' .2	3° 36' 32''	3

(Appendix A, Table 3, Nos. 115 and 116, and Table 2, No. 76.)

An additional series of five targets at 500 yards with the .45'' caliber gun No. 16 and hardened-bullet ammunition No. 58, had also been fired with the following results:

Fired December 17, from fixed rest—air calm : Mean absolute deviation, 10'' .9 ; corrected angle of sight, 1° 4' 26''. Gun quite clean after firing 105 shots. (Appendix A, Table 3, Nos. 88 to 92.)

FRANKFORD ARSENAL, *January 6, 1873.*

The President submitted to the Board the results of an additional series of five targets at 500 yards with the .45'' caliber gun No. 16 and hardened-bullet ammunition No. 58 as follows :

Fired December 24, from fixed rest. Wind generally from left rear, but very variable in force and direction.

Mean absolute deviation, 10'' .2 ; corrected angle of sight, 1° 2' 2''. Gun very clean after firing 100 shots. (Appendix A, Table 3, Nos. 93 to 97.)

Results of firing ten shots each, for penetration, at 500 yards, with .45'' caliber gun No. 16, and hardened-bullet ammunition No. 58, as compared with Martini-Henry, were also submitted as follows :

Penetration in white-pine boards at 500 yards, .45'' caliber,
(ammunition No. 58,) 70 grains powder, 400-grain bullet 8'' .8
Martini-Henry, 85 grains powder, 484-grain bullet. 11'' .2

Difference 2'' .4

(Appendix A, Table 6, Nos. 5 and 6.)

The President also submitted results of firing five targets at 500 yards, with .40'' caliber gun No. 13, and hardened-bullet ammunition No. 59, as follows :

Fired January 2, 1873, from fixed rest; wind from left rear, light : Mean absolute deviation, 10'' .2 ; corrected angle of sight, 59' 59''. (Appendix A, Table 1, Nos. 72 to 76.)

Another series of five targets had been fired at 500 yards, with the same gun as last, with the charge increased from 65 grains to 70 grains, (ammunition No. 60,) with the following results :

Fired January 3 and 4, 1873, from a fixed rest; air—mostly calm : Mean absolute deviation, 12'' .16 ; corrected angle of sight, 48' 46''. Gun but little fouled or leaded by 100 rounds. (Appendix A, Table 1, Nos. 77 to 81.)

FRANKFORD ARSENAL,
Philadelphia, January 16, 1873.

The President submitted records of firing at all ranges from 100 to 1,050 yards, for trajectory, with the .45" caliber barrel No. 16, using hardened-bullet ammunition No. 58, and the Martini-Henry No. 17, using its own ammunition No. 51.

These firings, having for their object only the determination of the angle of elevation necessary to attain each range with each gun, were fired from the shoulder and rest. Experience has shown that the fixed rest sets up certain vibrations in the gun which tend to obscure the results as regards elevation, the angle indicated being often much less than that required for shoulder-firing, and the disparity varying in amount and direction with differently shaped guns.

The angles of sight obtained by these firings are recorded in Table 4, together with those of the .40", .42", .45", and .50" caliber trajectories already obtained, as reported in proceedings of November 29 and 30, and December 2, 1872.

Those trajectories for 1,050 yards are represented together on Figures 19 and 20, projected, in the one case, to exhibit their relative "flatness," irrespective of the angles of departure; in the other, to exhibit the paths when fired with equal elevations.

Figures 21 and 22 exhibit the first 500 yards of the same trajectories on a larger scale.

FRANKFORD ARSENAL,
Philadelphia, January 21, 1873.

The President submitted to the Board additional targets at 800 yards, made by the .45" caliber rifle No. 16, using hardened-bullet ammunition No. 58, and with Martini-Henry rifle No. 17, using its own ammunition No. 51.

Three targets had been fired with each rifle, from shoulder and rest, with results as follows:

.45" caliber, 800 yards, gun 16, cartridge No. 58: Mean deviation, 19".5; 0 misses in 3 targets.

Martini-Henry: Mean deviation, 18".6; 7 misses in 3 targets. Gun 16, cartridge No. 58, corrected angle, 2° 13' 38". Martini-Henry, corrected angle, 2° 25' 38". (Appendix A, Table 3, Targets No. 107 to 113.)

Three targets had also been fired at 800 yards with .40" caliber ammunition No. 60, with hardened bullet using rifle 13; with indifferent accuracy, though with the usual low angle of that caliber.

Mean deviation, 27".2; corrected angle, 1° 52' 44". Gun fouled and leaded by 65 shots. (Appendix A, Table 1, Targets 85, 86, and 87.)

The President stated that further firing at 1,050 yards was rendered impracticable by the ice at the firing-station, occasionally deflecting bullets upon the public road. He believed, however, that sufficient results were in possession of the Board to enable them to judge intelligently about the practice at that range.

FRANKFORD ARSENAL, *January 25, 1873.*

There were submitted to the Board the record of five additional targets of Martini-Henry, firing at 500 yards, the gun not being cleaned during the trial. The results were as follows:

Martini-Henry, 45'' caliber, at 500 yards, five targets of twenty shots without cleaning: Mean absolute deviation, 10''.2; corrected angle of sight, 1° 4' 32''. Gun but slightly fouled by 102 shots. Wind—stiff breeze from left. (Appendix A, Table 3, Targets 98 to 102.)

FRANKFORD ARSENAL, *January 31, 1873.*

There were submitted to the Board on this last day of its session, the records of six targets fired with the .45'' caliber gun No. 16, and hardened-bullet ammunition, substantially the same as No. 58, but the *bullet made by machinery*. The experimental bullets used in trials thus far being required in but small quantities of each form, have been usually turned up from compressed lead; the construction of a cherry and pair of dies for the fabrication, by machinery, of each of the slight experimental variations that have been made in the bullet would have been attended with great loss of time, to say nothing of cost.

When, however, a bullet so satisfactory in all respects as the one used in ammunition No. 58 had been arrived at, it appeared desirable, before its final indorsement by the Board, that the practicability of producing it by machinery, without deterioration in any of its shooting qualities, should be demonstrated.

Such bullets were accordingly ordered, and the results of firing them for six targets of 20 shots each is here inserted; these results having arrived too late to be included in regular sequence in the tables of .45'' caliber, firing in Appendix A:

1st target, mean absolute deviation.....	8''.18
2d " " " "	10''.80
3d " " " "	6''.27
4th " " " "	7''.91
5th " " " "	9''.34
6th " " " "	8''.97
Average	8''.58
Corrected angle average.....	1° 4' 35''

This is the best average for an equal number of consecutive targets on record either at Springfield or Frankford, and the third is the best single target at 500 yards on record.

These results are not embodied in the summary which had been made up for this day's proceedings of the Board, and which appears further on. If so embodied they would make the total practice of this gun and ammunition, at 500 yards, give, in all weathers, the mean absolute deviation of 9''.57.

FRANKFORD ARSENAL,

Philadelphia, January 31, 1873.

The Board met pursuant to call of the President. Present, Major T. J. Treadwell and Lieutenant William Prince.

A communication from the President of the Board having directed that the members present consider the results obtained in the trials instituted by the Board, and express their opinions founded thereon, it was first—

Resolved, That "the determination of a proper caliber for small-arms,"

as stated in the order convening the Board, necessarily involves the determination of the system of rifling and chambering, as well as all the essential features of the ammunition.

The Board then carefully reviewed the proceedings and reports of experiments under the various points involved, as recorded in these minutes and in Appendices A and B.

The number of forms experimented with under each of the points considered were found to be briefly as follows :

Calibers.

Four calibers were tested in various forms as follows :

.40'' caliber.—Seven forms of barrel and twenty-seven forms of ammunition.

.42'' caliber.—Eleven forms of barrel and twenty-six forms of ammunition.

.45'' caliber.—Nine forms of barrel and twenty-five forms of ammunition.

.50'' caliber.—One form of barrel (service) and one form of ammunition, (service.)

Rifling.

Seven styles of grooves have been tested, with *ten* different twists, in various calibers, as follows :

3 grooves, plain, with seven different twists, in four calibers.

4 grooves, plain, with two different twists, in two calibers.

5 grooves, plain, with two different twists, in two calibers.

6 grooves, plain, with two different twists, in two calibers.

7 grooves, tangential, with two different twists, in two calibers.

7 grooves, "ratchet," with two different twists, in two calibers.

Variations have also been made in the width and depth of grooves, all which appear fully in the descriptions in Appendices A and B.

Chambering.

Various lengths and degrees of contraction in "bottle-shaped" chambers have been compared with each other and with straight chambers of different lengths, the "throats" of the chambers having also been variously modified at their junction with the rifled-bore.

Charge of powder.

Charges of 60, 65, 70, 75, 80, and 85 grains have been tried in various calibers and combinations, as follows, all fully described in Appendices A and B :

60 grains, in three calibers, five forms of barrel, six forms of cartridge.

65 grains, in three calibers, eleven forms of barrel, nineteen forms of cartridge.

70 grains, in four calibers, eleven forms of barrel, twenty forms of cartridge.

75 grains, in three calibers, twelve forms of barrel, sixteen forms of cartridge.

80 grains, in three calibers, twelve forms of barrel, thirteen forms of cartridge.

85 grains, in one caliber, one form of barrel, one form of cartridge.

Weight of bullet.

Bullets of various weights, from 290 to 484 grains, have been tested with various charges, calibers, chambers, twists, &c., as appears in the descriptions of ammunition in Appendices A and B.

Form of bullet.

Bullets of various forms, *cannelured* and plain, ellipsoidal, conoidal, and flat-fronted, have been tried with the several calibers and combinations, as described in Appendices A and B.

Material of bullet.

The experiments in this direction have been limited to lead and an alloy of lead with one-thirteenth its weight in tin.

Lubrication.

Various materials, tallow, bees-wax, Japan wax, bayberry wax, and graphite, applied in the *cannelures* as a disk at the base, in saturated paper, and as a coating in front, have been tried, with and without patches, as will be seen by descriptions in Appendices A and B.

Cases and priming.

These have only been considered so far as they affected the chambering of the gun and the lap on the bullet. Various degrees of contraction or "bottle-shape" have been compared with each other and with straight cases of different lengths. The merits of short and long lap have also been considered. Other details have been left to be determined by the practical considerations incidental to the manufacture of the case.

The various forms of bore and ammunition have been tested for accuracy, flatness of trajectory, cleanliness, (as evinced by sustained good practice,) penetration, pressures, velocities, and recoils. Regard has also been had to weight of barrel and cartridge, and to the form and strength of the latter.

In the course of the investigations upward of five hundred targets, of twenty shots each, have been fired at different ranges and under various conditions.

In order to narrow down the field of comparison and selection, it was determined that, in the prime condition of

Accuracy,

no system should be considered which could not show a mean absolute deviation of less than one foot at 500 yards from a series of five targets, of twenty shots each, fired without cleaning the gun.

On a review of the firing records of the experimental barrels and cartridges, this condition is found to be complied with in the following cases :

Mean absolute deviation at 500 yards. Five targets of twenty shots each without cleaning. Fired from fixed rest.

.40" caliber.

Gun No. 3, ammunition No. 17, mean deviation.....	10".4
Gun No. 13, ammunition No. 46, mean deviation.....	10".4
Gun No. 13, ammunition No. 59, mean deviation..	10".2

.42" caliber.

Gun No. 4, ammunition No. 38, mean deviation..... 10".0

.45" caliber.

Gun No. 2, ammunition No. 25, mean deviation..... 10".5
 Gun No. 11, ammunition No. 47, mean deviation..... 11".1
 Gun No. 16, ammunition No. 50, mean deviation..... 10".5
 Gun No. 16, ammunition No. 58, mean deviation..... 8".8
 Gun No. 16, ammunition No. 58, mean deviation..... 10".9
 Gun No. 16, ammunition No. 58, mean deviation..... 10".2

Additional series of targets have been fired with all these guns and cartridges substantially the same, but only in the case of gun No. 16, with cartridge No. 58, has the good practice been sustained under all circumstances of wind and weather.

On the occasion (December 12) of its making the mean absolute deviation of 8".8 from five targets without cleaning, (the best performance known to our records,) the wind, &c., is reported "strong from front and left, varied a good deal in intensity and direction; temperature 10° above zero, Fahr. Gun very clean after firing 103 shots." (Appendix A, Table 3, Targets 83 to 87.)

On the occasion (December 17) of making the mean absolute deviation of 10".9 the following remarks are recorded: "Wind calm. Gun quite clean after firing 105 shots." (Appendix A, Table 3, Targets 88 to 92.)

On the occasion (December 24) of making the mean absolute deviation of 10".2 it is remarked: "Wind very variable in force and direction; general direction from left. In the last two targets a little steadier than in others, from left and rear. Gun very clean after firing." The last three of these five targets average 9" mean absolute deviation. (Appendix A, Table 3, Targets 93 to 97.)

Accuracy at 800 yards—fired from shoulder and rest.

At this range the .40" calibers show an average—
 Mean absolute deviation of..... 27".2 with 3 misses to 2 targets.
 The .42" calibers 23".5 with 3 misses to 1 target.
 The .45" calibers 22".1 with 1 miss to 2 targets.
 Gun No. 16, with cartridge No. 58.... 20".4 with 1 miss to 2 targets.

Accuracy at 1,050 yards—fired from shoulder and rest.

At this range the .40" calibers show an average—
 Mean absolute deviation of 49".0
 The .42" calibers 46".0
 The .45" calibers 46".1
 Gun No. 16, with cartridge No. 58 35".2

The fact that these long-range firings were not executed from the fixed rest is to be considered in comparing them with other records.

Of the foreign arms fired for comparison, the Martini-Henry (English) was the only one whose sustained practice at 500 yards gave any pretensions to further trials at longer ranges. Its accuracy at the various ranges is as follows:

For 500 yards, mean deviation..... 9".9.
 For 800 yards, mean deviation..... 20".1, with 2 misses to a target.
 For 1,050 yards, mean deviation 33".7, with 5 misses to a target.

The next best foreign arm, the Russian-Berdan, stands as follows:

For 500 yards, mean deviation	14".9.
For 800 yards, mean deviation	26".7, with 7 misses.
For 1,050 yards, mean deviation	73".2, with 3 misses.

Flatness of trajectory.

In the matter of flatness of trajectory it is usual to judge by comparing the angles of sight of different guns at the same range. This method is, however, liable to mislead, from the fact that it is not the smallness of the angle at a given range that indicates a flat trajectory, but the smallness of the difference between that angle and the angles used for shorter ranges.

The actual trajectories, as exhibited in Figures 19 to 22, give a much clearer and more trustworthy record of the comparative merits of the guns, in the matter of flatness of trajectory, than any tables of angles could do.

The data required for their construction were obtained by firing from the shoulder and muzzle-rest, in order to eliminate any restraining effect of the fixed rest in modifying the angle of departure.

An inspection of Figure 19, which exhibits five different trajectories for 1,050 yards, the flattest is that of the .40" caliber, whose performance in other respects, however, has been shown to be indifferent at long ranges.

Then come two intersecting trajectories, the Martini-Henry and the .45" caliber gun No. 16, with ammunition No. 58. The former is the lower for 750 yards, the latter is lower at the close, a less angle of arrival, which determines the "dangerous space."

The .42" caliber comes next, and then the trajectory of the present $\frac{1}{2}$ -inch caliber. The angles of departure are indicated by the red-ink lines radiating upwards from the beginning of the trajectories, all angles being multiplied by ten to correspond with the vertical scale of the projections.

The angles of departure are rendered more conspicuous in Figure 20, which gives the path which would be pursued by each bullet if the guns were fired with equal elevation.

Figures 21 and 22 afford similar means of judging of the features of the 500-yard trajectory.

Cleanliness.

The comparative cleanliness of various systems is deemed to be sufficiently indicated by the degree to which their performance is sustained up to the last of the hundred shots, and the condition of the gun at the close, as given in the column of remarks in the tables of firing.

A clean gun at the close, with no material falling off in accuracy for 100 rounds, is a condition attained by several systems in each of the calibers and by some repeatedly.

In .40" caliber (table 1) it is attained by—

- Gun No. 3, ammunition No. 19, target No. 32, et seq.
- Gun No. 12, ammunition No. 44, target No. 39, et seq.
- Gun No. 13, ammunition No. 46, target No. 53, et seq.
- Gun No. 13, ammunition No. 46, target No. 67, et seq.
- Gun No. 13, ammunition No. 59, target No. 72, et seq.
- Gun No. 13, ammunition No. 60, target No. 77, et seq.

In .42" calibers (table 2) it is attained by—

Gun No. 4, ammunition No. 38, target No. 17, et seq.
 Gun No. 10, ammunition No. 38, target No. 22, et seq.
 Gun No. 10, ammunition No. 48, target No. 27, et seq.
 Gun No. 15, ammunition No. 49, target No. 36, et seq.
 Gun No. 20, ammunition No. 54, target No. 59, et seq.

In .45" calibers (table 3) it is attained by—

Gun No. 2, ammunition No. 25, target No. 2, et seq.
 Gun No. 5, ammunition No. 29, target No. 28, et seq.
 Gun No. 8, ammunition No. 39, target No. 50, et seq.
 Gun No. 11, ammunition No. 47, target No. 58, et seq.
 Gun No. 16, ammunition No. 50, target No. 63, et seq.
 Gun No. 16, ammunition No. 50, target No. 78, et seq.
 Gun No. 16, ammunition No. 58, target No. 83, et seq.
 Gun No. 16, ammunition No. 58, target No. 88, et seq.
 Gun No. 16, ammunition No. 58, target No. 93, et seq.

In all these cartridges the lubricant was applied in the *cannelures*, and the contrast with the practice obtained with patches, base-disks, greased patches, &c., is extremely marked. The lubricant employed in the best of the above practice was the compound originally used in the Springfield ammunition, and consists of eight parts of bayberry wax to one part of graphite.

This lubricant has of late years been replaced by Japan wax on account of the uncertainty of the supply of bayberry wax, but its superiority has always been acknowledged.

The only foreign system that shows no deterioration of practice in 100 rounds is the English "Martini-Henry." (Appendix A, Table 3, Targets 68 to 77.)

The Swiss "Vetterlin" comes out clean from the trial, but the ammunition is "dipped," a style of lubrication that generally secures cleanliness, but is itself objectionable on many accounts. (Appendix A, Table 2, Targets 41, et seq.)

The Dutch "Beaumont" comes out "badly fouled and leaded by 100 shots." (Appendix A, Table 3, Targets 40, et seq.)

The "Russian-Berdan," though the ammunition is "dipped" in addition to the base-lubrication, is reported "foul and leaded by 100 rounds." (Appendix A, Table 2, Targets 64, et seq.)

The Austrian "Werndl" goes completely wild after 60 shots. (Appendix A, Table 2, Targets 46, et seq.)

Penetration.

Trials for short-range penetrations have been dispensed with, a good penetration at 500 yards being assumed to include the lesser ranges.

By Table 6, Appendix A, the average penetrations in pine boards at 500 yards appear to stand as follows:

.50" caliber, service, 70 grains powder, 450 grains lead.....	7".2
.40" caliber, 65 grains powder, 350 grains lead.....	8".1
.42" caliber, 65 grains powder, 365 grains lead.....	8".6
.45" caliber, 70 grains powder, 400 grains lead.....	6".8
.45" caliber, 70 grains powder, 405 grains lead, hardened.....	8".8
Martini-Henry, 85 grains powder, 484 grains lead, hardened....	11".2

From which it appears that the .45" caliber (gun No. 16, ammunition No. 58) gives the greatest penetration of any experimental system tried; the additional 2".4 of the Martini-Henry being gained by 15 grains more powder and 80 grains more lead.

Recoils.

The absolute practical recoil of an arm is difficult of determination. Reliable comparative recoils are, however, obtained by allowing the butt to rest against a coiled spring with a proper index. The following relative recoils were so obtained :

.50" caliber, service.....	129.6 pounds.
.45" caliber, hardened bullet, gun 16, ammuniton 58.....	123.6 pounds.
Martini-Henry.....	139.3 pounds.

The Board was inclined to attach considerable importance to diminished recoil, deeming that refinements of action in other directions are largely thrown away if there is to be any flinching in the soldier who pulls the trigger.

In its view the additional 2".4 inches of penetration at 500 yards of the Martini-Henry is too dearly bought at 16 pounds increased recoil, leaving out of consideration the much heavier ammunition.

Pressures and velocities.

Experiments in this direction were directed to determining whether the straight or bottle-shaped chambers and cases sustained the greater pressure in communicating equal velocities.

It will be observed (Table 5, Appendix A) that, for every hundred feet of velocity impressed, the following number of pounds pressure per square inch was sustained, the charges being equal :

Bottle-shaped chamber.	Straight chamber.
.45" caliber.....1402 lbs.	.45" caliber.....1254 lbs.
.42" caliber.....1327 lbs.	.42" caliber.....1238 lbs.
	.40" caliber.....1434 lbs.

Weight of barrel.

The barrels for reduced calibers were first made to preserve the exterior dimensions of the present Springfield barrel, which of course gave increased weight. They were subsequently reduced, as appears in Descriptions of Arms.

The following figures indicate the increased weight of barrel incident to reduced bores. The weights are exclusive of breech-mechanism :

	Pounds.	Ounces.
No. 1, Springfield barrel, .50" caliber.....	4	-----
No. 8, Springfield barrel, .45" caliber.....	4	1
No. 4, Springfield barrel, .42" caliber.....	4	4
No. 3, Springfield barrel, .41" caliber.....	4	5

The metal of these barrels, when reduced to the same thickness as that of the Springfield barrel at the muzzle, while retaining the exterior

dimensions of the Springfield barrel near the breech, give the following weights:

	Pounds.	Ounces.
45'' caliber, lightened, Nos. 11 and 16.....	3	9
42'' caliber, lightened, Nos. 10, 15, and 20.....	3	7
40'' caliber, lightened, Nos. 9, 13, and 14.....	3	5½

In order to compare the weights of entire guns with those of foreign arms, the following weights of the lightened barrels, mounted as Springfield rifles, are recorded. The weights are exclusive of bayonets:

	Pounds.	Ounces.
Springfield rifle, caliber .50''.....	9	3
Nos. 11 and 16, caliber .45''.....	9	1½
Nos. 10, 15, and 20, caliber .42''.....	8	15½
Nos. 9, 13, and 14, caliber .40''.....	8	14
English "Martini-Henry".....	8	12
Russian "Berdan".....	9	2
Swiss "Vetterlin".....	10	.....
Dutch "Beaumont".....	9	11
Austrian "Werndl".....	9	11

Weight of ammunition.

The necessity for a soldier's carrying the largest possible number of cartridges, which is rendered imperative by the greatly-increased capacity of breech-loading arms, indicates the propriety of keeping down the weight of the cartridge to the minimum consistent with effective practice, and has been kept in view by the Board.

The following is a statement of the weight of 40 rounds of each of the cartridges mentioned:

	Pounds.	Ounces.
Springfield, .50'' caliber.....	3	13
No. 58, .45'' caliber.....	3	7
Nos. 49, &c., .42'' caliber.....	3	5
Nos. 59, &c., .40'' caliber.....	3	2
English "Martini-Henry".....	4	6
Russian "Berdan".....	3	7
Austrian "Werndl".....	2	14
Swiss "Vetterlin".....	2	10
Dutch "Beaumont".....	4	2

From which it appears that 51 rounds of ammunition No. 58 could be carried at less weight than 40 rounds of the only foreign ammunition whose performance assimilates with it, viz, the Martini-Henry.

Opinion.

In view of the results thus summarized, the Board is of opinion that, of the various experimental systems tried—

Barrel No. 16, (.45" caliber,) with ammunition No. 58, combines in the greatest degree the following qualities:

1. Accuracy in all winds.
2. Cleanliness, or sustained accuracy.
3. Flatness of trajectory.
4. Penetration at long ranges.
5. Moderate recoil.
6. Lightness of arm.
7. Lightness of ammunition.

This barrel and ammunition may be described as follows: (See also Figure 17 of Appendix A.)

Barrel No. 16.

Caliber.—Forty-five one-hundredths of an inch, (.45").

Length.—From the bottom of the bore to the muzzle, including chamber, thirty-two and one-half inches, (32".5.)

Weight.—Three pounds and nine ounces, avoirdupois, (3 pounds 9 ounces, avoirdupois.)

Rifling.—Three plain concentric grooves, equal in width to the lands, five one-thousandths of an inch (.005") deep, with an uniform twist of one turn in twenty-two inches, (22".)

Chamber.—To consume two inches and one hundred and sixty-five one-thousandths of an inch (2".165) of the length of the bore, divided as follows:

1st. A flange-seat, cylindrical, six hundred and forty-five one-thousandths of an inch (.645") in diameter, and sixty-five one-thousandths of an inch (.065") long.

2d. A conical frustum, two inches and thirty-five one-thousandths of an inch (2".035) long, five hundred and eight one-thousandths of an inch (.508") in diameter at its larger base next the flange-seat, and four hundred and eighty-two one-thousandths of an inch (.482") in diameter at its smaller base in front.

3d. A conical frustum, sixty-five one-thousandths of an inch (.065") long, four hundred and eighty-two one-thousandths of an inch (.482") in diameter at its larger base, next the last described frustum, and forty-five one-hundredths of an inch (.45") in diameter at its smaller base, where it meets the bore in front.

Ammunition No. 58.

Powder.—Seventy grains (70 grs.) "musket"-sized grain.

Bullet.—Twelve parts by weight of lead and one part by weight of tin, compressed. The form (disregarding for the moment the *cannelures*) is a cylinder, surmounted by a conical frustum, which is surmounted by a spherical segment. Length of cylinder, fifty-five one-hundredths of an inch, (.55"); diameter of cylinder, four hundred and fifty-eight one-thousandths of an inch, (.458"). Length of frustum, thirty-five one-hundredths of an inch (.35"); diameter of larger base next to cylinder, four hundred and fifty-eight one-thousandths of an inch, (.458"); diameter of smaller base, forty-two one-hundredths of an inch, (.42"); spherical segment tangential to the cone, nearly a hemisphere, making the total length of the bullet one inch and eleven one-hundredths of an inch, (1".11.)

Five rectangular *cannelures*, seventy-five one-thousandths of an inch (.075") wide, three one-hundredths (.03") of an inch deep, separated from

the base, and from each other by spaces of five one-hundredths of an inch, (.05''). A dished cavity in the base, sufficient to bring the bullet to a weight of four hundred and five grains, (405 grs.)

Case, metallic, simple-flanged frustum, of the following exterior dimensions :

Diameter of flange sixty-one one-hundredths of an inch, (.61''); thickness, sixty-five one-thousandths of an inch, (.065''); diameter of frustum, next to flange, five hundred and five one-thousandths of an inch, (.505''); diameter in front, forty-eight one-hundredths of an inch, (.48''); length of frustum, two inches and thirty-five one-thousandths of an inch, (2''.035.) Embracing the bullet for six hundred and twenty-five one-thousandths of an inch (.625'') of its length, and snugly choked around it without indenting.

Lubricant.—Eight parts of bayberry-wax and one part of graphite, applied in the *cannelures*.

The Board is of opinion that the material, method of manufacture, thickness and priming of the cartridge-cases, should be largely determined by practical considerations incident to their manufacture, and believe that, if the exigencies of fabrication require a less taper to the case and chamber than the one described, the larger diameter of both may be reduced by one one-hundredth of an inch (.01'') without affecting the efficiency of arm or ammunition.

In regard to "drift" or "derivation" toward the side of the twist, the Board is of opinion that, as it is a source of error inseparable from the use of a rifle with elongated projectile, it should be provided for by a curvature of the rear-sight leaf, the proper amount to be determined by extended firing of whatever system may be adopted. The trajectory of barrel No. 16, with ammunition No. 58, is represented in detail with "dangerous spaces," on Figure 23 accompanying this report.

Respectfully submitted to the Chief of Ordnance.

J. G. BENTON,

Major of Ordnance and President of Board.

T. J. TREADWELL,

Major of Ordnance.

WM. PRINCE,

First Lieutenant Ordnance, U. S. Army.

Approved :

A. B. DYER,

Chief of Ordnance.

NOTE.—Captain J. R. Edie, of the Ordnance Department, had the immediate supervision of the firings made at the Springfield Armory.

APPENDIX A.

DESCRIPTIONS OF GUNS.

Appendix to proceedings of the Board on calibers for small-arms ; convened by Special Order No. 107, Adjutant General's Office, May 7, 1872.

DESCRIPTION OF GUNS USED IN EXPERIMENTS.

No. 1.—The Springfield breech-loading rifle-musket, model 1870, caliber .50''. Three plain grooves equal in width to lands ; depth, .01'' at breech, .005'' at muzzle ; twist, uniform, one turn in 42''. Several of these guns

were used during the trials. Weight of gun, 9 pounds 3 ounces; weight of barrel, 4 pounds.

See Fig. 1 for form of chamber, &c.

No. 2.—.45" caliber barrel. Three plain grooves, equal in width to lands; depth, .01" at breech, .005" at muzzle; twist, uniform, one turn in 23". Chambered for bottle-shaped cases, to hold 75 or 80 grains of powder.

See Fig. 2 for form of chamber, &c. (Gun No. 51, Frankford Arsenal record.)

No. 3.—.40" caliber barrel. Three plain grooves, equal in width to lands; depth, .01" at breech, .005" at muzzle; twist, uniform, one turn in 18". Chambered for straight cases; frustum, 2".45 long; diameters, .45" and .43". Two of these guns were used during the trials. Weight of barrel, 4 pounds 5 ounces.

See Fig. 4 for form of chamber, &c. (Gun No. 78, Frankford Arsenal record.)

No. 4.—.42" caliber barrel. Three plain grooves, equal in width to lands; depth, .01" at breech, .005" at muzzle; twist, uniform, one turn in 18". Chambered for straight cases; frustum, 2".45 long; diameters, .48" and .45". Weight of barrel, 4 pounds 4 ounces.

See Fig. 5 for form of chamber, &c. (Gun No. 79, Frankford Arsenal record.)

No. 5.—.45" caliber barrel. Three plain grooves, equal in width to lands; depth, .01" at breech, .005" at muzzle; twist, uniform, one turn in 18". Chambered for bottle-shaped, short-lap cases, with necks .3" shorter than those used in gun No. 2.

See Fig. 9 for form of chamber, &c. (Gun No. 77, F. A. R.)

No. 6.—Dutch rifle-musket, .44" caliber (.455" bullet.) Four plain grooves, equal in width to lands; depth, .01"; twist, uniform, 30". Chambered for bottle-shaped cases. Weight of gun, 9 pounds 11 ounces.

See Fig. 10 for form of chamber, &c. (Gun No. 81, F. A. R.)

No. 7.—Russian-Berdan rifle-musket, .42" caliber. Six plain grooves, twice the width of the lands; depth, .01"; twist, uniform, 20". Chambered for bottle-shaped cases. Weight of gun, 9 pounds 2 ounces.

See Fig. 11 for form of chamber, &c. (Gun No. 71, F. A. R.)

No. 8.—.45" caliber. Three plain grooves, equal in width to lands; depth, .01" at breech, .005" at muzzle; twist, uniform, 18". Chambered for straight cases, frustum 2".24 long, diameters .511" and .48". Weight of barrel, 4 pounds 1 ounce.

See Fig. 12 for form of chamber, &c. (Gun No. 83, F. A. R.)

No. 9.—.40" caliber. Like No. 3, but barrel lightened by reducing the exterior diameter until the walls were no thicker than in the service-rifle, caliber .50" at the muzzle, though retaining the full service external dimensions at the breech. Weight of barrel, 3 pounds 5½ ounces. Weight of gun, 8 pounds 14 ounces. (Gun No. 84, F. A. R.) Figure 4, chamber.

No. 10.—.42" caliber. Like No. 4, but barrel lightened by reducing the exterior diameter until the walls were no thicker than in the service-rifle, caliber .50" at the muzzle, though retaining the full service external dimensions at the breech. Twist changed from 18" to 20". Weight of barrel, 3 pounds 7 ounces. Weight of gun, 8 pounds 14½ ounces. (Gun No. 85, F. A. R.) Figure 5, chamber.

No. 11.—.45" caliber. Like No. 8, but barrel lightened by reducing the exterior diameter until the walls were no thicker than in the service-rifle, caliber .50" at the muzzle, though retaining the full service

external dimensions at the breech. Twist changed from 18" to 22". Weight of barrel, 3 pounds 9 ounces. Weight of gun, 8 pounds 14 ounces. (Gun No. 86, F. A. R.) Figure 12, chamber.

No. 12.—.40" caliber. Henry barrel, seven tangential (Henry) grooves, .164" wide; lands, .01" wide; twist, uniform, 18". Chambered for straight cases, frustum 2".5 long, diameters .45" and .43". (Gun No. 87, F. A. R.) Figure 4, chamber.

No. 13.—.40" caliber, short throat, light barrel. Like No. 3, but barrel lightened and throat of chamber shortened to .06" to accommodate cartridges in which the bullet was pressed into the case until all the *cannelures* were covered. Weight of barrel, 3 pounds 5½ ounces. Weight of gun, 8 pounds 14 ounces.

See Fig. 14 for form of chamber, &c. (Gun No. 88, F. A. R.)

No. 14.—.40" caliber, medium throat, light barrel. Like No. 3, but barrel lightened and throat of chamber shortened to .2" to accommodate cartridges in which the bullet was pressed into the case until all but one of the *cannelures* were covered. Weight of barrel, 3 pounds 5½ ounces. Weight of gun, 8 pounds 14 ounces.

See Fig. 13 for form of chamber, &c. (Gun No. 89, F. A. R.)

No. 15.—.42" caliber, short throat, light barrel. Like No. 4, but barrel lightened and throat of chamber shortened to accommodate cartridges where all the *cannelures* of the bullet are covered by the case. Twist 20". Chamber also shortened .13" to accommodate the shortened case of ammunition No. 49. Weight of barrel, 3 pounds 7 ounces. Weight of gun, 8 pounds 15½ ounces.

See Fig. 15 for form of chamber, &c. (Gun No. 90, F. A. R.)

No. 16.—.45" caliber, short throat, light barrel. Like No. 8, but with grooves of a uniform depth of .005", and the barrel lightened and throat of chamber shortened to accommodate cartridges where all the *cannelures* are covered by the case. Twist 22". Chamber also shortened .18" to accommodate ammunition No. 50. Weight of barrel, 3 pounds 9 ounces. Weight of gun, 9 pounds 1½ ounces.

See Fig. 16 for form of chamber, &c. (Gun No. 91, F. A. R.)

No. 17.—Martini-Henry, English, caliber .45"; uniform twist, 22"; seven grooves, tangential. Weight of gun, 8 pounds 12 ounces.

See Fig. 18 for form of chamber, &c. (Gun No. 92, F. A. R.)

No. 18.—Vetterlin, Swiss, caliber .411", (classed with .42" caliber.) Magazine-arm. Uniform twist, 26".5; 4 grooves, equal to width of lands. Weight of gun 10 pounds. (Gun No. 93, F. A. R.)

No. 19.—Werndl, Austrian, caliber .425". Uniform twist, 28"; 6 grooves, twice width of lands. Weight of gun 9 pounds 11 ounces. (Gun No. 94, F. A. R.)

No. 20.—.42" caliber. Like No. 15, but with a twist of 24". Figure 15, chamber. (Gun No. 95, F. A. R.)

No. 21.—.42" caliber. Short bottle-shaped chamber. Twist, 30". Three plain grooves, equal in width to lands, used for comparing *pressures* of bottle-shaped chamber with straight chamber. (Gun No. 47, F. A. R.)

DESCRIPTION OF AMMUNITION TESTED.

Fig. 1—No. 1—"Service" cal. .50" Centre-fire metallic cartridge. Powder, 70 grains "musket;" bullet, 450 grains lead, cylindro-conoidal; length, 1"; diameter of cylindrical portion, .515"; length of cylindrical portion, .54"; diameter of front, .1"; 3 rectangular *cannelures*, .07" wide and .02" deep, beginning .1" from base; inter-*cannelures* .06"

wide; case, copper, 1".75 long; diameters .562" to .54"; diameter of flange, .665"; priming, Frankford Arsenal cup or "Martin pocket;" lubrication, Japan wax in *cannelures*. Total length of cartridge, 2".25. Total weight, 665 to 670 grains.

Fig. 4 (a)—No. 2—.40" caliber. Straight case. Powder, 80 grains "musket;" bullet, 350 grains, lead, smooth, blunt, cylindro-ellipsoidal; diameter, .4"; length, 1".12; length of cylindrical portion, .56"; case, copper, 2".5 long; diameters .44" to .43"; diameter of flange, .515"; priming, "Martin pocket;" lubrication, a greased patch of two wraps of bank-note paper saturated with bayberry wax. Total length of cartridge, 3".28. Total weight, 558 grains. (F. A., No. 221.)

Fig. 4 (a)—No. 3—.40" caliber. Like No. 2, but with charge of 57 grains; same length, powder less compressed. (F. A., No. 222.)

Fig. 4 (a)—No. 4—.40" caliber. Like No. 2, but with charge of 70 grains; same length, powder less compressed. (F. A., No. 223.)

Fig. 4 (a)—No. 5—.40" caliber. Like No. 2, but with charge of 65 grains; same length, powder less compressed. (F. A., No. 224.)

Fig. 4 (a)—No. 6—.40" caliber. Like No. 2, but bullet end dipped in bayberry wax after completion. (F. A., No. 225.)

Fig. 4 (a)—No. 7—.40" caliber. Like No. 2, but with 75-grain charge, and bullet end dipped in bayberry wax after completion. (F. A., No. 226.)

Fig. 4 (a)—No. 8—.40" caliber. Like No. 2, but with 70-grain charge and bullet end dipped in bayberry wax after completion. (F. A., No. 227.)

Fig. 4 (a)—No. 9—.40" caliber. Like No. 2, but with 65-grain charge, and bullet end dipped in bayberry wax after completion. (F. A., No. 228.)

Fig. 4 (b)—No. 10—.40" caliber. Like No. 2, except bullet, which weighs 400 grains, is 1".3 long, with 7 rectangular *cannelures*, blunt cylindro-ellipsoidal; diameter, .405"; length of cylindrical portion, .75", lubricated in the *cannelures*. Total length of cartridge, 3".45. Total weight, 613 grains. (F. A., No. 229.)

Fig. 4 (c)—No. 11—.40" caliber. Like No. 2, but with 75-grain charge, and bullet with 4 *cannelures*, lubricated in *cannelures* only; no patch. (F. A., No. 230.)

Fig. 4 (c)—No. 12—.40" caliber. Like No. 2, but with 70-grain charge, and bullet with 4 *cannelures*, lubricated in *cannelures* only; no patch. (F. A., No. 231.)

Fig. 4 (c)—No. 13—.40" caliber. Like No. 2, but with 65-grain charge, and bullet with 4 *cannelures*, lubricated in *cannelures* only; no patch. (F. A., No. 232.)

Fig. 4 (c)—No. 14—.40" caliber. Like No. 2, but with 70-grain charge, and bullet with 5 *cannelures* .01" deep, lubricated in *cannelures* and dipped; no patch. (F. A., No. 233.)

Fig. 4 (c)—No. 15—.40" caliber. Like No. 2, but with 65-grain charge, and bullet with 5 *cannelures* .01" deep, lubricated in *cannelures* and dipped; no patch. (F. A., No. 234.)

Fig. 4 (c)—No. 16—.40" caliber. Like No. 2, but with 70-grain charge, and bullet with 5 *cannelures* .01" deep, lubricated in the *cannelures* only. (F. A., No. 235.)

Fig. 4 (c)—No. 17—.40" caliber. Like No. 2, but with 65-grain charge, and bullet with 5 *cannelures* .01" deep, lubricated in the *cannelures* only. (F. A., No. 236.)

Fig. 4 (c)—No. 18—.40" caliber. Like No. 2, but with 60-grain charge,

and bullet with 5 *cannelures* .01" deep; lubricated in the *cannelures* only. (F. A., No. 237.)

Fig. 4 (c)—No. 19—.40" caliber. Like No. 2, but with 65-grain charge, and bullet with 5 *cannelures* .02" deep; weight, 340 grains; lubricated in the *cannelures* only. (F. A., No. 238.)

Fig. 5—No. 20—.42" caliber. Straight case. Powder, 70 grain musket; bullet 370 grains lead, blunt cylindro-ellipsoidal, with 4 rectangular *cannelures* .01" deep; diameter, .425"; length, 1".08; length of cylindrical portion, .54"; case, copper, 2".45 long; diameters, .48" to .45"; diameter of flange .55"; priming, "Martin pocket;" lubrication in *cannelures* only. Total length of cartridge, 3".1. Total weight, 580 grains. (F. A., No. 239.)

Fig. 5—No. 21—.42" caliber. Like No. 20, but with 75-grain charge; same length; powder more compressed. (F. A., No. 240.)

Fig. 5—No. 22—.42" caliber. Like No. 20, but with 80-grain charge; same length; powder more compressed. (F. A., No. 241.)

Fig. 5—No. 23—.42" caliber. Like No. 20, but with *cannelures* of bullet .02" deep; weight, 365 grains. (F. A., No. 242.)

Fig. 4 (d)—No. 24—.40" caliber. Like No. 2, but with 70-grain charge, and 290-grain bullet; length of bullet, .96". Total length of cartridge, 3".1. (F. A., No. 243.)

Fig. 2 (a)—No. 25—.45" caliber. Bottle-shaped, *cannelured*. Powder, 75 grains musket; bullet, cylindro-conoidal, 3 *cannelures* .1" at surface, .09" wide at bottom, .025" deep; beginning .17" from base of bullet, inter-*cannelures* .07" wide; weight, 440 grains; length, 1".1; length of cylindrical portion, .75"; diameter, .46"; diameter of flat front, .15"; case, copper, bottle-shaped, 2" long; base same as service-case, (No. 1;) contraction to .46" internal diameter at 1".4 from base; priming, Frankford Arsenal cup; lubrication, Japan wax in *cannelures* and dipped. Total length of cartridge, 2".5. Total weight, 679 grains. (F. A., No. 155.)

Fig. 6—No. 26—.45" caliber. Bottle-shaped, *cannelured*; short-lap same as No. 25, but throat of case shortened .2" and bullet inserted but .2"; wad of lubricant behind bullet .2" to fill up the case; case knurled into bullet. (F. A., No. 217.)

Fig. 3 (a)—No. 27—.45" caliber. Bottle-shaped, smooth patched. Powder, 75 grains musket; bullet, cylindro-ellipsoidal; weight, 425 grains; length, 1".09; length of cylindrical portion, .64"; diameter, .45", patched with two wraps of bank-note paper for .5" of its length; lubrication, a disk of Japan wax behind the bullet; case, copper, bottle-shaped, 2" long, base same as service-case, (No. 1,) contraction to .46" internal diameter at 1".4 from base; priming, Frankford Arsenal cup. Total length of cartridge, 2".6. Total weight, 670 grains. (F. A., No. 205.)

Fig. 7—No. 28—.45" caliber. Bottle-shaped, smooth short-lap, same as No. 27 but throat of case shortened .2" and bullet inserted but .15"; wad of lubricant behind bullet to make up the length; no patch; case knurled into bullet. (F. A., No. 218.)

Fig. 8—No. 29—.45" caliber. Bottle-shaped. Laidley bullet, short-lap; powder, 75 grains musket; bullet, cylindro-ellipsoidal; weight, 483 grains; length, 1".25; length of cylindrical portion, .75"; diameter, .45"; five rectangular *cannelures* .06" wide, beginning .2" from base; inter-*cannelures* .06" wide; one narrow *cannelure* on the ellipsoidal portion, .45" from front; diameter of cylindrical portion diminished to .44" for .15" from the base to allow for lap of case, diameter of bullet decreasing abruptly by .015" at the junction of the cylindrical with the el-

lipsoidal portion; material lead, cast and swaged; *cannelures* turned in after swaging; case, copper, bottle-shaped, 1".7 long; base same as service-case, (No. 1,) contraction to .45" internal diameter at 1".4 from base, lapping .15" on bullet without crimp; priming, Frankfort Arsenal cup; lubrication, Japan wax in *cannelures* and wad behind the bullet, dipped in Japan wax and tallow. Total length of cartridge, 2".8. Total weight, 727 grains. (F. A., No. 219.)

Fig. 8—No. 30—.45" caliber. Laidley bullet, like No. 29, but with case .3" longer in the neck and extending .3" further on the bullet. Total length the same. Total weight, 743 grains. (F. A., No. 20.)

Fig. 10—No. 31—.45" caliber. Dutch rifle-musket cartridge. Powder, musket-grain, dull, rounded, not uniform, 70 grains; bullet, lead, cast and swaged, cylindro-conoidal, flat fronted, weight 340 grains; length, .93"; length of cylindrical portion, .46"; diameter, .455"; diameter of flat front, .15"; one *cannelure* of segmental section .16" wide, .045" deep, beginning .12" from base; case, brass, bottle-shaped, solid flange; length, 2"; diameter of flange, .67"; greatest exterior diameter of case, .58"; contraction begins 1".25 from base; laps .45" on bullet; priming, outside cap, continuous pocket; lubrication, wax in *cannelure* and a disk of tallow behind bullet; felt wad behind tallow. Total length of cartridge, 2".5. Total weight, 725 grains. (F. A., No. 247.)

Fig. 11—No. 32—.42" caliber. Russian-Berdan cartridge, made by Union Metallic Cartridge Company, of Bridgeport, Connecticut. Powder, Smith & Rand's "musket," 80 grains; bullet, lead, pressed, cylindro-ellipsoidal; weight, 375 grains; length of cylindrical portion, 0.77". Total length, 1".1; diameter, .42"; patched with two wraps of bank-note paper, extending .6" on the bullet; case, brass, bottle-shaped, folded flange, with interior re-enforcing ring; length, 2".25; diameter of flange, .64"; greatest exterior diameter of case, .515"; contraction begins 1".7 from base; laps .35" on bullet; priming, outside cap, with Berdan return-anvil pocket in base; lubrication, disk of stearine in paper capsule behind bullet; bullet end also dipped in stearine after completion. Total length, 3". Total weight, 602 grains. (F. A., No. 159.)

Fig. 5—No. 33—.42" caliber. Like No. 20, but with *cannelures* of bullet .02" deep, and charge of 65 grains. (F. A., No. 252.)

Fig. 5—No. 34—.42" caliber. Like No. 20, but with *cannelures* of bullet .02" deep, and charge of 75 grains. (F. A., No. 253.)

Fig. 5—No. 35—.42" caliber. Like No. 20, but with *cannelures* of bullet .02" deep, and charge of 80 grains. (F. A., No. 254.)

Fig. 5—No. 36—.42" caliber. Like No. 20, but with *cannelures* of bullet .02" deep, and charge of 60 grains. (F. A., No. 255.)

Fig. 4 (c)—No. 37—.40" caliber. Like No. 2, but with 60-grain charge and bullet with 5 *cannelures* .02" deep; lubricated in *cannelures* only. (F. A., No. 256.)

Fig. 5—No. 38—.42" caliber. Like No. 20, but with *cannelures* of bullet .02" deep; weight, 365 grains, and charge of 65 grains. (F. A., No. 257.)

Fig. 12 (a)—No. 39—.45" caliber. Straight case. Powder, 65 grains "musket"; bullet, 400 grains, lead blunt cylindro-ellipsoidal, with 4 rectangular *cannelures* .02" deep; diameter, .455"; length, 1".04; length of cylindrical portion, .6"; case, copper, 2".18 long; diameters, .5" to .475"; diameter of flange, .58"; priming, "Martin pocket;" lubrication, bayberry wax and graphite in *cannelures* only. Total length of cartridge, 2".78. Total weight, 600 grains. (F. A., No. 258.)

Fig. 12 (a)—No. 40—.45" caliber. Like No. 39, but with charge of 70 grains. (F. A., No. 259.)

Fig. 12 (a)—No. 41—.45" caliber. Like No. 39, but with charge of 75 grains. (F. A., No. 260.)

Fig. 12 (a)—No. 42—.45" caliber. Like No. 39, but with charge of 80 grains. (F. A., No. 261.)

Fig. 12 (a)—No. 43—.45" caliber. Like No. 39, but with charge of 60 grains. (F. A., No. 262.)

Fig. 4 (c)—No. 44—.40" caliber. Straight case. Powder, 65 grains "musket"; bullet lead, cast and swaged, blunt cylindro-ellipsoidal, 5 rectangular *cannelures* .02" deep; length, 1".1; diameter, .405"; length of cylindrical portion, .65"; weight, 340 grains; case, copper, 2".5 long; diameters, .44" to .43"; diameter of flange, .515"; case covers 3 *cannelures*; priming, "Martin pocket"; lubrication, bayberry-wax and graphite in *cannelures*. Total length of cartridge, 3".18. Total weight, 545 grains. (F. A., No. 263.)

Fig. 13—No. 45—.40" caliber. Like No. 44, but the bullet pressed in until the case covers four instead of three *cannelures*, making the total length of the cartridge 3".11. (F. A., No. 264.)

Fig. 14—No. 46—.40" caliber. Like No. 44, but the bullet pressed in until the case covers all the *cannelures* making the total length of the cartridge 3". (F. A., No. 265.)

Fig. 12 (b)—No. 47—.45" caliber. Like No. 39, but with 70-grain charge, and the bullet pressed in until all the *cannelures* were covered by the case, making the total length of the cartridge 2".68. (F. A., No. 266.)

No. 48—.42" caliber. Like No. 20, but with 65-grain charge, and 365-grain bullet with *cannelures* .02" deep, entirely covered by the case, making the total length of the cartridge 3". (F. A., No. 267.)

Fig. 15—No. 49—.42" caliber. Like No. 20, but with 65-grain charge and 365-grain bullet with *cannelures* .02" deep, entirely covered by the case, which is shortened .13", making the total length of the cartridge 2".8, and total weight 578 grains. (F. A., No. 268.)

Fig. 16—No. 50—.45" caliber. Like No. 39, but with 70-grain charge, and the bullet pressed in until all the *cannelures* are covered by the case, which is shortened .18", making the total length of the cartridge 2".5, and weight 593 grains. (F. A., No. 269.)

Fig. 18—No. 51.—Martini-Henry, English, .45" caliber. Bullet lead, hardened with tin, cast and swaged, cylindro-conoidal; diameters of cylindrical portion, .45" to .44", length of do. .9"; total length of bullet, 1".28; weight, 484 grains; cylindrical portion patched with two wraps of bank-note paper, one small *cannelure* .15" from base for crimping only; powder, 85 grains "musket;" case, brass foil, extremely contracted or bottle-shaped, iron flange, separate priming-pocket and two re-enforcing base-cups outside; length, 2".38; diameter of flange, .74"; diameter next to flange .65", tapering to .6" at 1".2 from base, then suddenly contracting to about .47" by 4 plaits, so as to embrace the bullet, which it does, for .5" being secured by an annular crimp in the *cannelure* of the bullet; priming, outside cap and anvil, in an inserted pocket; lubrication, a thick disk of wax, between two disks of paste-board behind the bullet. Total length of cartridge, 3".15; weight of cartridge, 767 grains. (F. A., No. 275.)

No. 52—Vetterlin-Swiss—.411" caliber, (classed with .42" cal. guns in Report.) Bullet lead, cast and swaged, cylindro-ellipsoidal; cylindrical portion .57" long, with .35" of its length at rear reduced from .42" to .39" diameter, to allow for lap of case; cavity in base .2" deep; one large *cannelure* near base to facilitate expansion, two other smaller ones on

the exposed portion of bullet to hold lubricant; no patch; total weight 312 grains. Powder, 60 grains "musket;" case, copper, slightly bottle-shaped; length, 1".5; diameter of flange, .615"; diameter next to flange, .53", tapering to .50" in 1", thence contracting by an easy curve to .42" diameter, embracing the bullet for .35"; lubrication only by dipping; priming inside. Total length of cartridge, 2".2. Weight, 464 grains. (F. A., No. 276.)

No. 53.—Werndl-Austrian—caliber, .425", (classed with .42" cal. guns in Report.) Bullet lead, cast cylindro-conoidal, two rectangular *cannelures*, both exposed; diameter of cylindrical portion, .43"; length of do., .5"; total length, .9"; weight, 318 gains; flat front, .1" diameter; powder, 65 grains "musket," supplied by us, being as much as the case furnished would hold; case, copper, straight; length, 1".6; diameter of flange, .59"; diameter next to flange, .51"; laps only .1" on the bullet by a snug throat; lubrication in the exposed *cannelures*. Priming, outside cap. Total length of cartridge, 2".4. Weight, 504 grains.

N. B.—This ammunition was made up in this country from bullets and primed cases furnished from Austria, by inserting as much powder as the case would contain, (65 grains.) The powder was the same as used in our own service cartridge. (F. A., No. 277.)

Fig. 15.—No. 54—.42" caliber. Like No. 20, but with 365-grain bullet, with *cannelures* .02" deep, entirely covered by the case, which is shortened .2", making the total length of the cartridge 2".8. (F. A., No. 278.)

Fig. 15.—No. 55—.42" caliber. Like No. 20, but with 75-grain charge, and 365-grain bullet, with *cannelures* .02" deep, entirely covered by the case, which is shortened .2", making the total length of the cartridge 2".8. (F. A., No. 279.)

No. 56—.45" caliber. Bottled-shaped. For pressures, to compare with No. 50, straight case. Powder, 70 grains "musket;" bullet, 400 grains, 3 *cannelures* inserted .55"; case, bottled-shaped, contracted from ordinary .50" caliber case to a .46" throat, as in ammunition No. 29; lubrication in *cannelures*. (F. A., No. 270.)

No. 57—.42" caliber. Bottle-shaped. For pressures, to compare with No. 49, straight case. Powder, 65 grains "musket;" bullet, 370 grains, 3 *cannelures*, inserted .55"; case, bottle-shaped, contracted from ordinary .50" caliber case to a .43" throat; lubrication in *cannelures*. (F. A., No. 271.)

Fig. 17.—No. 58—.45" caliber. Hardened bullet. Powder, 70 grains "musket;" bullet lead, hardened with $\frac{1}{13}$ tin, blunt cylindro-ellipsoidal, with 5 rectangular *cannelures*; length, 1".11; diameter, .46"; length of cylindrical portion, .62"; width of *cannelures*, .075"; depth of *cannelures*, .03"; width of inter-*cannelures*, .05"; weight, 405 grains; case, copper, straight frustum; length, 2".1; diameter of flange, .606"; diameter next to flange, .505"; diameter in front, .48", covering all the *cannelures* of bullet; lubrication, bayberry wax and graphite in the *cannelures*; priming, inside, ("Martin pocket.") Total length of cartridge, 2".6. Total weight, 604 grains. (F. A., No. 280.)

Fig. 14.—No. 59—.40" caliber. Hardened bullet. Like No. 44, but bullet hardened with $\frac{1}{13}$ tin and pressed in until the case covers all the *cannelures*, making the total length of the cartridge 3". Total weight of cartridge, 542 grains. (F. A., No. 283.)

Fig. 14.—No. 60—.40" caliber. Hardened bullet, same as last, but charge increased from 65 grains to 70 grains. (F. A., No. 284.)

APPENDIX A.—TABLES OF FIRING.

TABLE No. 1.—Forty caliber at 500 yards—targets of 20 shots.

Number of target.	Gun.			Ammunition.				Shots since last cleaned.	Wind.	Mean deviation.	Corrected angle.	Date, post, and record number.	Remarks.
	Number.	Twist.	Chamber.	Number.	Weight of powder.	Weight of bullet.	Form of bullet.						
1	3	18	Straight.	24	70	grs. 290	Smooth, patched.	0	.....	14.3.....	53 57	1872. May 18, S. A., 156	Only 10 shots fired; not reduced.
2	3	18	do	24	70	290	do	0	.....	Wild	.....	May 22, S. A., 161	Gun badly fouled and leaded.
3	3	18	do	2	80	350	do	0	Strong from right rear.	16.0.....	53 11	May 27, S. A., 167	Do.
4	3	18	do	3	75	350	do	0	Strong from left rear.	16.9.....	52 48	June 1, S. A., 169	Gun badly fouled.
5	3	18	do	4	70	350	do	0	do	15.0.....	53 30	June 1, S. A., 171	Gun badly fouled and leaded.
6	3	18	do	5	65	350	do	0	Light from right rear.	15.3.....	1 0 15	June 7, S. A., 173	Gun but little fouled and not leaded.
7	3	18	do	6	80	350	Greased patch and dipped.	8	Light from right	20.9.....	45 35	June 7, S. A., 176	Do.
8	3	18	do	7	75	350	do	8	Light, shifting right front to right rear.	21.8.....	46 37	June 7, S. A., 177	Do.
9	3	18	do	8	70	350	do	8	do	11.3.....	53 13	June 7, S. A., 178	Do.
10	3	18	do	9	65	350	do	8	Light from right	12.0.....	57 36	June 7, S. A., 175	Do.
11	3	18	do	10	80	400	7 cannellures	0	Calm; rain	22.5.....	48 42	June 8, S. A., 179	Gun little fouled and very slightly leaded.
12	3	18	do	11	75	350	4 cannellures	0	Calm; moist	14.2.....	50 52	June 8, S. A., 181	Gun moderately fouled; good deal leaded.
13	3	18	do	12	70	350	do	0	do	11.2.....	54 10	June 8, S. A., 182	Gun but little fouled; trace of lead.
14	3	18	do	13	65	350	do	0	do	9.2.....	59 11	June 8, S. A., 183	Gun but little fouled; good deal leaded.
15	3	18	do	14	70	350	5 cannellures	0	Light from left front	13.7.....	56 58	June 18, S. A., 184	Gun but slightly fouled and not leaded.
16	3	18	do	15	65	350	do	0	do	17.9.....	1 1 43	June 18, S. A., 185	Do.
17	3	18	do	16	70	350	In cannellures	0	Light from right rear	16.1.....	59 23	June 24, S. A., 186	Gun very badly fouled and leaded.
18	3	18	do	17	65	350	do	0	Light from left front; rain.	7.8.....	1 1 19	June 25, S. A., 187	Gun not cleaned for next target.
19	3	18	do	17	65	350	do	20	Calm	7.5.....	59 26	June 25, S. A., 188	Do.
20	3	18	do	17	65	350	do	40	Calm; rain	10.5.....	1 0 20	June 25, S. A., 189	Do.
21	3	18	do	17	65	350	do	60	do	7.45.....	59 0	June 25, S. A., 190	Do.
22	3	18	do	17	65	350	do	80	Light from left front; rain.	18.6.....	59 36	June 25, S. A., 191	Gun good deal fouled and leaded by 100 shots.

23	3	18	do	16	70	350	do	do	0	Calm	18.7	55 54	June 27, S. A., 192	Gun not cleaned for next target.
24	3	18	do	16	70	350	do	do	20	do	22.1	56 1	June 27, S. A., 193	Do.
25	3	18	do	16	70	350	do	do	40	do	29.1	56 22	June 27, S. A., 194	Gun considerably fouled and leaded by 60 shots.
26	3	18	do	18	60	350	do	do	0	Light from right rear	8.8	1 8 27	June 27, S. A., 195	Gun moderately fouled and good deal leaded.
27	3	18	do	17	65	350	do	do	0	do	13.4	1 0 35	July 3, S. A., 201	Gun not cleaned for next target.
28	3	18	do	17	65	350	do	do	20	do	19.9	1 0 58	July 3, S. A., 202	Do.
29	3	18	do	17	65	350	do	do	40	do	34.0; 2 misses.	1 3 48	July 3, S. A., 203	Gun much fouled and leaded by 60 shots.
30	3	18	do	17	65	350	do	do	0	do	12.5	57 11	July 3, S. A., 205	Gun not cleaned for next target.
31	3	18	do	17	65	350	do	do	20	do	Wild; 4 misses.	.....	July 3, S. A., 206	Only 18 shots fired; much leaded.
32	3	18	do	19	65	340	5 cannelures, .02" deep.	do	0	Light from left rear	11.8	58 37	July 5, S. A., 207	Gun not cleaned for next target.
33	3	18	do	19	65	340	do	do	20	do	10.5	59 37	July 5, S. A., 209	Do.
34	3	18	do	19	65	340	do	do	46	Calm	12.3	1 0 8	July 5, S. A., 216	Do.
35	3	18	do	19	65	340	do	do	67	Light from front	13.1	58 58	July 6, S. A., 219	Do.
36	3	18	do	19	65	340	do	do	87	do	12.5; 2 misses.	57 23	July 6, S. A., 221	Gun entirely clean after 107 shots.
37	3	18	do	37	60	340	do	do	4	Strong from left front; gusty.	7.7	59 10	July 13, S. A., 231	Gun very clean after 24 shots.
38	12	18	do	44	65	340	do	do	0	Calm	15.1	56 57	Aug. 24, S. A., 267	(Henry barrel.)
39	12	18	do	44	65	340	do	do	6	Strong from left front	15.4	1 1 25	Aug. 28, S. A., 274	Gun not cleaned for next target, (Henry.)
40	12	18	do	44	65	340	do	do	26	do	15.1	1 0 14	Aug. 28, S. A., 275	Do.
41	12	18	do	44	65	340	do	do	46	do	11.3	1 0 56	Aug. 28, S. A., 276	Do.
42	12	18	do	44	65	340	do	do	68	Calm	13.8	1 0 27	Aug. 28, S. A., 277	Do.
43	12	18	do	44	65	340	do	do	88	do	13.1	1 1 22	Aug. 28, S. A., 278	Condition after 108 shots—quite clean.
44	3	18	do	46	65	340	do	do	0	Fresh from left	11.7	58 54	Sept. 4, S. A., 284	} These three targets were fired by alternate shots.
45	3	18	do	45	65	340	do	do	0	Strong from left	13.3	58 23	Sept. 4, S. A., 285	
46	3	18	do	44	65	340	do	do	0	do	14.9	59 34	Sept. 4, S. A., 286	
47	3	18	do	46	65	340	do	do	0	do	17.9	58 40	Sept. 4, S. A., 287	
48	3	18	do	45	65	340	do	do	0	do	13.4	56 59	Sept. 4, S. A., 288	
49	3	18	do	44	65	340	do	do	0	do	18.0	58 43	Sept. 4, S. A., 289	Light barrel.
50	9	18	do	46	65	340	do	do	0	Light; variable	16.8	1 0 58	Sept. 6, S. A., 290	Do.
51	9	18	do	46	65	340	do	do	0	Light from right rear	14.6	1 1 32	Sept. 6, S. A., 291	Do.
52	9	18	do	46	65	340	do	do	0	do	18.6	1 1 51	Sept. 6, S. A., 292	Light barrel, short throat; gun not cleaned for next target.
53	13	18	do	46	65	340	do	do	3	Light from front	9.2	59 27	Sept. 7, S. A., 307	Do.
54	13	18	do	46	65	340	do	do	23	do	13.8	56 53	Sept. 7, S. A., 308	Do.
55	13	18	do	46	65	340	do	do	43	do	8.9	57 17	Sept. 7, S. A., 309	Do.
56	13	18	do	46	65	340	do	do	54	do	12.6	58 9	Sept. 7, S. A., 310	Do.
57	13	18	do	46	65	340	do	do	84	do	7.3	56 10	Sept. 7, S. A., 311	Very clean after 104 shots.
58	14	18	do	45	65	340	do	do	0	Calm	15.8	.....	Oct. 18, S. A., 327	Light barrel, medium throat; gun not cleaned for next target.

TABLE No. 1.—Forty caliber at 500 yards—targets of 20 shots—Continued.

Number of target.	Gun.				Ammunition.				Shots since last cleaned.	Wind.	Mean deviation.	Corrected angle.	Date, post, and record number.	Remarks.
	Number.	Twist.	Chamber.	Number.	Weight of powder.	Weight of bullet.	Form of bullet.	Lubrication.						
59	14	18	Straight.	45	65 grs.	340 grs.	5 cannelures, .02" deep.	In cannelures.	20	Calm	15.8	57 36	Oct. 18, S. A., 328	Light barrel, medium throat; gun not cleaned for next target.
60	14	18	do	45	65	340	do	do	40	do	18.2	57 40	Oct. 18, S. A., 329	Do.
61	14	18	do	45	65	340	do	do	60	do	24.7	56 17	Oct. 18, S. A., 330	Do.
62	14	18	do	45	65	340	do	do	80	do	24.4	57 54	Oct. 18, S. A., 331	Fouled and leaded by 100 rounds.
63	13	18	do	46	65	340	do	do	0	do	19.3	1 0 44	Oct. 18, S. A., 332	Short throat, short cartridge.
64	13	18	do	46	65	340	do	do	0	Light from left front.	11.9	54 20	Oct. 25, S. A., 338	Long throat, short cartridge.
65	9	18	do	46	65	340	do	do	0	Light from front.	21.8	59 48	Oct. 25, S. A., 339	Medium throat, short cartridge.
66	14	18	do	46	65	340	do	do	0	do	13.7	57 27	Oct. 25, S. A., 340	tridge.
67	13	18	do	46	65	340	do	do	0	Strong from left	13.5	58 25	Dec. 4, S. A., 387	Gun not cleaned for next target.
68	13	18	do	46	65	340	do	do	20	do	13.9	1 0 14	Dec. 4, S. A., 388	Do.
69	13	18	do	46	65	340	do	do	40	Strong from left rear.	19.8	1 1 36	Dec. 4, S. A., 389	Do.
70	13	18	do	46	65	340	do	do	60	do	19.3	59 5	Dec. 4, S. A., 390	Do.
71	13	18	do	46	65	340	do	do	80	Light from left rear.	12.2	1 0 13	Dec. 4, S. A., 391	Gun clean after 100 shots.
72	13	18	do	59	65	340	5 cannelures	do	0	Light from left front.	9.3	1 0 49	Jan. 2, S. A., 423	Hardened bullet; gun not cleaned for next target.
73	13	18	do	59	65	340	do	do	20	do	10.3	1 0 9	Jan. 2, S. A., 424	Do.
74	13	18	do	59	65	340	do	do	40	do	9.6	59 47	Jan. 2, S. A., 425	Do.
75	13	18	do	59	65	340	do	do	60	do	12.2	59 49	Jan. 2, S. A., 426	Do.
76	13	18	do	59	65	340	do	do	80	do	9.7	59 22	Jan. 2, S. A., 427	Rather fouled and a little leaded by 100 shots.
77	13	18	do	60	70	340	do	do	0	Calm	11.4	49 50	Jan. 3, S. A., 428	Hardened bullet; gun not cleaned for next target.
78	13	18	do	60	70	340	do	do	20	do	15.3	49 4	Jan. 3, S. A., 429	Do.
79	13	18	do	60	70	340	do	do	40	do	12.2	48 41	Jan. 3, S. A., 430	Do.
80	13	18	do	60	70	340	do	do	60	do	7.7	48 22	Jan. 3, S. A., 431	Do.
81	13	18	do	60	70	340	do	do	80	Stiff from right rear	14.2	47 54	Jan. 4, S. A., 432	But little fouled or leaded by 100 shots.

Forty caliber at 800 yards—targets of 20 shots. Fired from shoulder and rest.

82	3	18	Straight.	44	65	340	5 cannellures, .02" deep.	In cannellures.	0	Strong from right rear.	25. 7.	1 59 49	1872. Aug. 6, S. A., 259	Fouled and leaded by 32 shots. Hardened bullet. Do. Hardened bullet; fouled and leaded.
83	3	18	do	44	65	340	do	do	0	Light from right rear.	23. 3.	1 44 36	Aug. 8, S. A., 261	
84	13	18	do	46	65	340	do	do	0	Calm	32. 2; 7 misses.	2 7 5	Dec. 7, S. A., 401	
85	13	18	do	60	70	340	do	do	0	Light breeze from left rear.	21. 6.	1 53 21	Jan. 17, S. A., 439	
86	13	18	do	60	70	340	do	do	20	do	26. 5.	1 51 41	Jan. 17, S. A., 440	Do. Hardened bullet; fouled and leaded.
87	13	18	do	60	70	340	do	do	40	do	33. 6; 2 misses.	1 53 13	Jan. 17, S. A., 441	

Forty caliber at 1,050 yards—targets of 20 shots. Fired from shoulder and rest.

88	3	18	Straight.	44	65	340	5 cannellures	In cannellures.	5	Calm	43 4.	3 25 12	1872. Aug. 24, S. A., 268	Gun not cleaned for next target. Do. Condition.
89	3	18	do	44	65	340	do	do	27	do	50. 3.	3 10 16	Aug. 24, S. A., 269	
90	3	18	do	44	65	340	do	do	50	do	53. 3.	3 5 44	Aug. 24, S. A., 270	

TABLE NO. 2.—Forty-two caliber at 500 yards—targets of 20 shots.

1	4	18	Straight.	20	70	370	4 cannellures	In cannellures.	0	Fresh from right rear.	Wild.	Not reduced.	July 8, S. A., 222	Gun much fouled and leaded. Do. Do. Gun quite clean.
2	4	18	do	21	75	370	do	do	0	do	do	do	July 8, S. A., 223	
3	4	18	do	22	80	370	do	do	0	do	do	do	July 8, S. A., 224	
4	4	18	do	23	70	370	4 cannellures, .02" deep.	do	0	do	9. 26.	1 2 11	July 9, S. A., 225	
5	7	20	Bottle.	32	80	375	Smooth patched.	Base and dipped.	0	Light breeze from right of rear.	9. 1.	1 1 47	Aug. 22, F. A., 1338	8 grains fouling, (Russian.) 9. 7 grains fouling. 7 grains fouling. 6 grains fouling.
6	7	20	do	32	80	375	do	do	0	do	11. 7.	1 1 7	Aug. 22, F. A., 1339	
7	7	20	do	32	80	375	do	do	0	Light breeze, in puffs.	12. 5.	1 2 27	Aug. 22, F. A., 1340	
8	7	20	do	32	80	375	do	do	0	Light breeze rear of right.	10. 0.	1 2 27	Aug. 22, F. A., 1341	Gun not clean for next target. Do. Do.
9	7	20	do	32	80	375	do	do	0	Light breeze from right.	11. 9.	1 2 53	Aug. 22, F. A., 1342	
10	7	20	do	32	80	375	do	do	22	Faint breeze from rear of right.	17. 5.	1 2 36	Aug. 22, F. A., 1343	
11	7	20	do	32	80	375	do	do	44	Faint breeze from right of rear.	15. 0.	1 3 13	Aug. 22, F. A., 1344	18 grains fouling by 88 shots. Considerably fouled and a little leaded. But little fouled or leaded. Considerably fouled and leaded.
12	7	20	do	32	80	375	do	do	66	do	14. 7.	1 4 31	Aug. 22, F. A., 1345	
13	4	18	Straight.	33	65	370	4 cannellures	In cannellures.	3	Light from rear; variable.	9. 07.		July 11, S. A., 226	
14	4	18	do	34	75	370	do	do	4	Gusty from left rear; changing.	19. 2.		July 11, S. A., 227	Considerably fouled and leaded.
15	4	18	do	35	80	370	do	do	0	Light from left.	26. 5.		July 11, S. A., 228	

TABLE NO. 2.—Forty-two caliber at 500 yards—targets of 20 shots—Continued.

Number of target.	Gun.			Ammunition.				Shots since last cleaned.	Wind.	Mean deviation.	Corrected angle.	Date, post, and record number.	Remarks.
	Number.	Twist.	Chamber.	Number.	Weight of powder.	Weight of bullet.	Form of bullet.						
16	4	18	Straight.	36	60 grs.	370 grs.	4 cannelures.....	3	Light from left front; gusty.	6.9.....	0 1 "	July 11, S. A., 230	But little fouled; not leaded.
17	4	18	do	38	65	365	do	0	Calm	10.3.....	1 9 1	July 18, S. A., 232	Gun not cleaned for next target.
18	4	18	do	38	65	365	do	22	Light from left front.	10.6.....	1 7 32	July 18, S. A., 232½	Do.
19	4	18	do	38	65	365	do	42	do	9.2.....	1 7 29	July 18, S. A., 233	Do.
20	4	18	do	38	65	365	do	62	Light from right front.	7.7.....	1 7 5	July 18, S. A., 234	Do.
21	4	18	do	38	65	365	do	84	Light from right; variable.	12.0.....	1 6 31	July 18, S. A., 235	Quite clean after 104 shots.
22	10	20	do	38	65	365	do	11	Strong from left rear; shifting.	14.5.....	1 9 3	Aug. 31, S. A., 279	Gun not cleaned for next target; light barrel.
23	10	20	do	38	65	365	do	33	Strong from left rear; shifting and variable.	13.8.....	1 7 20	Aug. 31, S. A., 280	Do.
24	10	20	do	38	65	365	do	59	do	15.0.....	1 7 11	Aug. 31, S. A., 281	Do.
25	10	20	do	38	65	365	do	81	do	12.3.....	1 8 6	Aug. 31, S. A., 282	Do.
26	10	20	do	38	65	365	do	102	do	13.5.....	1 6 25	Aug. 31, S. A., 283	Gun very clean after 122 shots.
27	10	20	do	48	65	365	do	2	Strong from left.	12.0.....	1 6 58	Sept. 9, S. A., 298	Gun not cleaned for next target.
28	10	20	do	48	65	365	do	22	do	11.8.....	1 6 25	Sept. 9, S. A., 303	Do.
29	10	20	do	48	65	365	do	42	Strong from left front.	12.8.....	1 8 2	Sept. 9, S. A., 304	Do.
30	10	20	do	48	65	365	do	63	do	11.1.....	1 8 53	Sept. 9, S. A., 305	Do.
31	10	20	do	48	65	365	do	83	do	12.6.....	1 7 49	Sept. 9, S. A., 306	Gun very clean after 103 shots.
32	15	20	do	49	65	365	do	0	Shifting from right	13.4.....	.....	Sept. 21, S. A., 317	Gun not cleaned for next target.
33	15	20	do	49	65	365	do	20	do	18.4; 1 miss.	.....	Sept. 21, S. A., 318	Do.
34	15	20	do	49	65	365	do	40	From rear	13.3.....	.....	Sept. 21, S. A., 319	Gun not cleaned for next target.
35	10	20	do	49	65	365	do	0	From left	16.0.....	.....	Sept. 21, S. A., 320	
36	15	20	do	49	65	365	do	0	Shifting	16.0.....	1 17 9	Oct. 12, S. A., 322	Gun not cleaned for next target.
37	15	20	do	49	65	365	do	20	do	14.2.....	1 17 4	Oct. 12, S. A., 323	
38	15	20	do	49	65	365	do	40	do	13.6.....	1 16 45	Oct. 12, S. A., 324	Do.

39	15	20	...do....	49	65	365	do	do	60	do	13.9....	1 16 53	Oct.	12, S. A.,	325	Do.
40	15	20	...do....	49	65	365	do	do	80	do	14.2....	1 16 44	Oct.	12, S. A.,	326	But slightly fouled by 110 shots.
41	18	26.5	Slightly bottle.	52	60	312	2 cannelures, both exposed.	do	0	Strong from right rear.	21.9....	1 27 36	Nov.	9, S. A.,	351	Vetterlin, Swiss, cal. 411".
42	18	26.5	do	52	60	312	do	do	20	do	21.9....	1 26 8	Nov.	9, S. A.,	352	Do.
43	18	26.5	do	52	60	312	do	do	40	do	20.2....	1 20 48	Nov.	9, S. A.,	353	Do.
44	18	26.5	do	52	60	312	do	do	60	do	23.0....	1 21 53	Nov.	9, S. A.,	354	Do.
45	18	26.5	do	52	60	312	do	do	80	Stiff from right rear.	25.9....	1 27 21	Nov.	9, S. A.,	355	Quite clean after 100 shots.
46	19	28	Straight.	53	65	318	2 cannelures.	In cannelures.	0	Very light from right rear.	34.6; 1 miss.	1 20 27	Nov.	16, S. A.,	359	Wernld, Austrian, cal. 425".
47	19	28	do	53	65	318	do	do	21	do	36.1; 2 misses.	1 18 28	Nov.	16, S. A.,	360	Do.
48	19	28	do	53	65	318	do	do	43	do	30.6; 2 misses.	1 20 25	Nov.	16, S. A.,	361	Do.
49	19	28	do	53	65	318	do	do	63	do	Wild; 7 misses.	Not reduced.	Nov.	16, S. A.,	362	Do.
50	19	28	do	53	65	318	do	do	83	do	Wild; 8 misses.	do	Nov.	16, S. A.,	363	Much fouled and slightly leaded by 103 shots.
51	15	20	do	54	70	365	4 cannelures	do	0	Calm	16.9....	1 7 38	Nov.	22, S. A.,	365	Gun not cleaned for next target.
52	15	20	do	55	75	365	do	do	0	do	20.1....	1 5 28	Nov.	22, S. A.,	366	
53	15	20	do	49	65	365	do	do	0	do	10.0....	1 13 38	Nov.	22, S. A.,	364	
54	20	24	do	54	70	365	do	do	2	do	8.6....	1 3 23	Nov.	26, S. A.,	367	
55	20	24	do	54	70	365	do	do	22	Light breeze from left front.	11.4....	1 4 6	Nov.	26, S. A.,	368	Do.
56	20	24	do	54	70	365	do	do	41	do	14.1....	1 4 7	Nov.	26, S. A.,	369	Do.
57	20	24	do	54	70	365	do	do	61	Calm	15.0....	1 4 1	Nov.	27, S. A.,	370	Do.
58	20	24	do	54	70	365	do	do	81	do	14.8....	1 4 58	Nov.	27, S. A.,	371	Gun slightly fouled by 101 shots.
59	20	24	do	54	70	365	do	do	0	Light breeze from right rear.	12.4....	1 4 3	Dec.	3, S. A.,	377	Gun not cleaned for next target.
60	20	24	do	54	70	365	do	do	20	do	12.1....	1 4 17	Dec.	3, S. A.,	378	Do.
61	20	24	do	54	70	365	do	do	40	do	13.2....	1 2 59	Dec.	3, S. A.,	379	Do.
62	20	24	do	54	70	365	do	do	60	Calm	13.0....	1 4 18	Dec.	3, S. A.,	380	Do.
63	20	24	do	54	70	365	do	do	80	do	14.0....	1 5 14	Dec.	3, S. A.,	381	Gun slightly fouled by 100 shots.
64	7	20	Bottle.	32	80	375	Smooth	Base and dipp'd	0	do	12.6....	1 0 10	Dec.	3, S. A.,	382	Russian-Berdan.
65	7	20	do	32	80	375	do	do	20	do	15.1....	1 0 40	Dec.	3, S. A.,	383	Do.
66	7	20	do	32	80	375	do	do	40	do	13.6....	59 53	Dec.	3, S. A.,	384	Do.
67	7	20	do	32	80	375	do	do	60	do	16.8....	59 27	Dec.	3, S. A.,	385	Do.
68	7	20	do	32	80	375	do	do	80	do	16.4....	59 36	Dec.	3, S. A.,	386	Gun foul and leaded by 100 rounds.

Forty-two caliber at 800 yards—targets of 20 shots. Fired from shoulder and rest.

69	4	18	Straight.	33	65	365	4 cannelures	In cannelures.	0	Light from right rear	22.0....	2 4 27	Aug.	8, S. A.,	260	Russian-Berdan.
70	20	24	do	54	70	365	do	do	0	Calm	21.8; 2 misses.	2 11 15	Dec.	7, S. A.,	400	
71	7	20	Bottle.	32	80	375	Smooth	Base & dipped.	0	do	26.7; 7 misses.	2 7 3	Dec.	7, S. A.,	399	

TABLE NO. 2.—Forty-two caliber at 1,050 yards—targets of 20 shots. Fired from shoulder and rest—Continued.

Number of target.	Gun.			Ammunition.				Shots since last cleaned.	Wind.	Mean deviation.	Corrected angle.	Date, post, and record number.	Remarks.
	Number.	Twist.	Chamber.	Number.	Weight of powder.	Weight of bullet.	Form of bullet.						
72	4	18	Straight.	33	65	370	4 cannelures	0	Light from right	47.4	3 29 36	1872. Aug. 22, S. A., 266	Gun not cleaned for next target. Do. Russian-Berdan.
73	4	18	do	33	65	370	do	4	Calm	41.9	3 26 59	Aug. 26, S. A., 271	
74	4	18	do	33	65	370	do	30	do	32.7	3 18 38	Aug. 26, S. A., 272	
75	4	18	do	33	65	370	do	53	do	56.5	3 24 1	Aug. 26, S. A., 273	
76	7	20	Bottle	32	80	375	Smooth	0	do	73.2; 3 misses.	3 36 32	Dec. 16, S. A., 411	

TABLE NO. 3.—Forty-five caliber at 500 yards—targets of 20 shots.

1	2	23	Bottle	25	75	440	3 cannelures	4	Light from right rear.	11.1	1 5 13	July 3, S. A., 204	Only 16 shots fired.
2	2	23	do	25	75	440	do	0	Light from left	10.2	1 4 19	July 5, S. A., 211	Gun not cleaned for next target.
3	2	23	do	25	75	440	do	20	Stiff, right and left rear, shifting.	11.0	1 3 45	July 5, S. A., 213	Do.
4	2	23	do	25	75	440	do	40	Light from front	9.5	1 6 46	July 5, S. A., 215	Do.
5	2	23	do	25	75	440	do	60	Light from left front	10.9	1 7 32	July 6, S. A., 218	Do.
6	2	23	do	25	75	440	do	80	Light from right front	10.7	1 5 48	July 6, S. A., 220	Gun quite clean after 100 shots.
7	2	23	do	25	75	440	do	0	do	11.4	1 5 1	June 3, F. A., 1266	2 grains fouling.
8	2	23	do	25	75	440	do	0	do	9.3	1 6 0	June 3, F. A., 1271	Do.
9	2	23	do	25	75	440	do	0	Light from rear	10.8	1 6 12	June 17, F. A., 1276	4.4 grains fouling.
10	2	23	do	25	75	440	do	0	Light from right rear	12.6	1 2 23	June 17, F. A., 1281	5 grains fouling.
11	2	23	do	25	75	440	do	0	Light from left front	14.2	1 7 11	June 25, F. A., 1290	3 grains fouling.
12	2	23	do	25	75	440	do	0	Light from left	11.3	1 9 7	June 25, F. A., 1292	Do.
13	2	23	do	25	75	440	do	0	Light from right front	9.9	1 3 18	June 27, F. A., 1294	Clean—wind in puffs.
14	2	23	do	25	75	440	do	0	do	12.2	1 5 2	June 27, F. A., 1296	Clean.
15	2	23	do	26	75	440	3 cannelures, 2 exposed.	0	Calm	17.5	1 4 24	June 3, F. A., 1265	3 grains fouling.
16	2	23	do	26	75	440	do	0	Light from right front	17.4	1 6 26	June 3, F. A., 1270	9 grains fouling.

17	2	23	do	26	75	440	do	do	do	0	Light from right rear.	20.4	1	3	30	June 17, F. A., 1275	5 grains fouling.
18	2	23	do	26	75	440	do	do	do	0	Light from right front.	15.2	4	5	41	June 17, F. A., 1280	6.4 grains fouling.
19	2	23	do	27	75	425	Smooth, patched.	Base and dipp'd	do	0	Light from front.	15.7	1	6	5	June 3, F. A., 1267	12 grains fouling.
20	2	23	do	27	75	425	do	do	do	0	Light from right front.	12.7	1	4	34	June 3, F. A., 1272	6 grains fouling.
21	2	23	do	27	75	425	do	do	do	0	Light from right rear.	18.0	1	1	34	June 17, F. A., 1278	3 grains fouling.
22	2	23	do	28	75	425	Smooth, 6-7 exposed.	do	do	0	Light from right.	22.9	59	55		June 17, F. A., 1277	5 grains fouling.
23	2	23	do	28	75	425	do	do	do	0	Calm.	19.6	1	3	52	June 17, F. A., 1282	6.6 grains fouling.
24	2	23	do	29	75	483	6 cannellures, all exposed.	In cannellures and dipp'd.	do	0	Light from left front.	16.9	1	7	14	June 25, F. A., 1289	4 grains fouling.
25	2	23	do	29	75	483	do	do	do	0	do	11.4	1	6	3	June 25, F. A., 1291	1 grain fouling.
26	2	23	do	29	75	483	do	do	do	0	Light from right front.	14.8	1	1	6	June 27, F. A., 1293	Clean—wind in puffs.
27	2	23	do	29	75	483	do	do	do	0	do	15.1	1	1	48	June 27, F. A., 1295	Clean.
28	5	18	do	29	75	483	do	do	do	0	Fresh from left of rear.	12.7	1	2	20	July 24, F. A., 1305	Gun not cleaned for next target.
29	5	18	do	29	75	483	do	do	do	23	do	13.8	1	2	49	July 24, F. A., 1306	Do.
30	5	18	do	29	75	483	do	do	do	46	do	11.7	1	3	30	July 24, F. A., 1307	Do.
31	5	18	do	29	75	483	do	do	do	66	do	11.8	1	2	41	July 24, F. A., 1308	2 grains fouling from 86 shots.
32	6	30	do	31	70	340	1 cannellure	In cannellures and disk.	do	0	Light from right front.	21.8	58	32		Aug. 12, F. A., 1316	6 grains fouling. (Dutch.)
33	6	30	do	31	70	340	do	do	do	0	do	16.3	56	46		Aug. 12, F. A., 1318	8 grains fouling. (Dutch.)
34	6	30	do	31	70	340	do	do	do	0	Light from right.	16.5	59	26		Aug. 13, F. A., 1321	7 grains fouling. (Dutch.)
35	6	30	do	31	70	340	do	do	do	0	Light from right front.	12.0	56	34		Aug. 13, F. A., 1323	Do.
36	6	30	do	31	70	340	do	do	do	0	Light from right.	15.5	58	48		Aug. 17, F. A., 1328	Gun not cleaned for next target. (Dutch.)
37	6	30	do	31	70	340	do	do	do	22	do	14.5	55	59		Aug. 17, F. A., 1330	Do.
38	6	30	do	31	70	340	do	do	do	46	do	15.3	57	2		Aug. 17, F. A., 1332	Do.
39	6	30	do	31	70	340	do	do	do	68	do	16.1	56	40		Aug. 17, F. A., 1334	13 grains fouling from 90 shots.
40	6	30	do	31	70	340	do	do	do	0	Calm	16.0	58	3		Aug. 3, S. A., 254	Gun not cleaned for next target. (Dutch.)
41	6	30	do	31	70	340	do	do	do	20	do	16.0	56	8		Aug. 3, S. A., 255	Do.
42	6	30	do	31	70	340	do	do	do	40	do	19.6	57	9		Aug. 3, S. A., 256	Do.
43	6	30	do	31	70	340	do	do	do	60	do	15.5	59	18		Aug. 3, S. A., 257	Do.
44	6	30	do	31	70	340	do	do	do	80	do	18.4	56	38		Aug. 3, S. A., 258	Badly fouled and leaded by 100 shots.
45	8	18	Straight	39	65	400	4 cannellures	In cannellures	do	6	Strong from left front.	11.3	1	3	37	July 24, S. A., 236	Very clean after 26 shots.
46	8	18	do	40	70	400	do	do	do	0	Light from left front.	9.9	1	1	55	July 24, S. A., 237	Very clean after 20 shots.
47	8	18	do	41	75	400	do	do	do	0	do	13.1	55	2		July 24, S. A., 238	Do.
48	8	18	do	42	80	400	do	do	do	0	do	12.1	58	25		July 24, S. A., 239	But little fouled or leaded.
49	8	18	do	43	60	400	do	do	do	0	Strong; variable.	12.7	1	2	40	July 25, S. A., 240	Very clean after 20 shots.
50	8	18	do	39	65	400	do	do	do	4	Light from right; variable.	11.7	1	5	47	July 29, S. A., 241	Gun not cleaned for next target.
51	8	18	do	39	65	400	do	do	do	25	do	13.6	1	3	24	July 29, S. A., 242	Do.
52	8	18	do	39	65	400	do	do	do	45	Light from right and rear; variable.	10.6	1	4	31	July 29, S. A., 243	Do.
53	8	18	do	39	65	400	do	do	do	65	do	12.7	1	3	51	July 29, S. A., 244	Quite clean after 85 shots.
54	8	18	do	40	70	400	do	do	do	0	Very light from right rear.	10.3	56	10		July 31, S. A., 245	Gun not cleaned for next target.
55	8	18	do	40	70	400	do	do	do	23	Light from right rear.	7.3	59	15		July 31, S. A., 246	Do.
56	8	18	do	40	70	400	do	do	do	44	do	13.4	59	9		July 31, S. A., 247	Do.
57	9	18	do	40	70	400	do	do	do	64	Calm; rain	18.7	1	0	45	July 31, S. A., 248	But little fouled, and not leaded by 84 shots

TABLE NO. 3.—Forty-five caliber at 500 yards—targets of 20 shots—Continued.

Number of target.	Gun.				Ammunition.				Shots since last cleaned.	Wind.	Mean deviation.	Corrected angle.			Date, post, and record number.	Remarks.
	Number.	Twist.	Chamber.	Number.	Weight of powder.	Weight of bullet.	Form of bullet.	Lubrication.								
58	11	22	Straight	47	70	400	4 cannelures	In cannelures.	5	Light from right rear.	"	10.2	1	1 11	1872 6, S. A., 293	Gun not cleaned for next target.
59	11	22	do	47	70	400	do	do	25	do	16.4	1	2 50	Sept.	6, S. A., 294	Do.
60	11	22	do	47	70	400	do	do	45	do	8.2	1	0 44	Sept.	7, S. A., 295	Do.
61	11	22	do	47	70	400	do	do	66	do	9.0	1	1 2	Sept.	7, S. A., 296	Do.
62	11	22	do	47	70	400	do	do	86	do	11.8	1	0 31	Sept.	7, S. A., 297	Moderately fouled; not lead- ed by 106 shots.
63	16	22	do	50	70	400	do	do	0	Light from left	11.0	1	1 51	Oct.	3, S. A., 312	Gun not cleaned for next target.
64	16	22	do	50	70	400	do	do	20	do	10.2	1	1 13	Oct.	3, S. A., 313	Do.
65	16	22	do	50	70	400	do	do	41	do	11.8	1	1 46	Oct.	3, S. A., 314	Do.
66	16	22	do	50	70	400	do	do	6	do	10.2	1	0 19	Oct.	3, S. A., 315	Do.
67	16	22	do	50	70	400	do	do	81	do	9.8	1	1 37	Oct.	3, S. A., 316	Do.
68	17	22	Bottle	51	85	484	1 cannelure	Base	0	Light from right rear	10.9	1	7 29	Nov.	8, S. A., 346	Quite clean after 101 shots.
69	17	22	do	51	85	484	do	do	20	Strong from right rear.	9.7	1	5 28	Nov.	8, S. A., 347	„Martini-Henry,” (English.)
70	17	22	do	51	85	484	do	do	40	Light from right rear.	11.5	1	6 12	Nov.	8, S. A., 348	Do.
71	17	22	do	51	85	484	do	do	61	Strong from right rear.	8.2	1	6 40	Nov.	8, S. A., 349	Do.
72	17	22	do	51	85	484	do	do	81	do	11.4	1	5 15	Nov.	8, S. A., 350	Do.
73	17	22	do	51	85	484	do	do	0	Calm	7.1	1	7 51	Dec.	2, S. A., 372	Quite clean after 101 shots.
74	17	22	do	51	85	484	do	do	20	do	8.5	1	8 18	Dec.	2, S. A., 373	„Martini-Henry,” (English.)
75	17	22	do	51	85	484	do	do	40	do	7.8	1	8 53	Dec.	2, S. A., 374	Do.
76	17	22	do	51	85	484	do	do	60	do	10.6	1	7 48	Dec.	2, S. A., 375	Do.
77	17	22	do	51	85	484	do	do	80	do	11.5	1	7 54	Dec.	2, S. A., 376	Gun but slightly fouled and not leaded by 100 rounds.
78	16	22	Straight	50	70	400	4 cannelures	In cannelures.	6	Stiff from right rear	11.6	1	4 32	Dec.	5, S. A., 392	Gun not cleaned for next tar- get.
79	16	22	do	50	70	400	do	do	26	do	13.7	1	4 42	Dec.	5, S. A., 393	Do.
80	16	22	do	50	70	400	do	do	46	Light from right rear	16.3	1	5 36	Dec.	5, S. A., 394	Do.
81	16	22	do	50	70	400	do	do	66	do	14.3	1	6 46	Dec.	5, S. A., 395	Do.
82	16	22	do	50	70	400	do	do	86	do	12.6	1	4 43	Dec.	5, S. A., 396	Slightly fouled and leaded by 106 shots.
83	16	22	do	58	70	405	5 cannelures	do	3	Strong from left front; and variable in direc- tion and intensity.	11.4	1	1 33	Dec.	12, S. A., 402	Bullet hardened with 1-12 tin.

84	16	22	do	58	70	405	do	23	do	7.4	59 39	Dec. 12, S. A.,	403	Do.
85	16	22	do	58	70	405	do	43	do	7.1	59 55	Dec. 12, S. A.,	404	Do.
86	16	22	do	58	70	405	do	63	do	10.2	59 0	Dec. 12, S. A.,	405	Do.
87	16	22	do	58	70	405	do	83	do	8.03	59 46	Dec. 12, S. A.,	406	Very clean after 103 shots.
88	16	22	do	58	70	405	do	0	do	8.4	1 4 5	Dec. 17, S. A.,	412	Hardened bullet.
89	16	22	do	58	70	405	do	21	do	8.3	1 4 2	Dec. 17, S. A.,	413	Do.
90	16	22	do	58	70	405	do	44	do	13.4	1 4 58	Dec. 17, S. A.,	414	Do.
91	16	22	do	58	70	405	do	64	do	12.8	1 4 43	Dec. 17, S. A.,	415	Do.
92	16	22	do	58	70	405	do	84	do	11.8	1 4 27	Dec. 17, S. A.,	416	Gun quite clean after 105 shots.
93	16	22	do	58	70	405	do	0	do	13.1	1 3 5	Dec. 24, S. A.,	418	Hardened bullet.
94	16	22	do	58	70	405	do	20	do	10.9	1 2 6	Dec. 24, S. A.,	419	Do.
95	16	22	do	58	70	405	do	40	do	8.6	1 2 33	Dec. 24, S. A.,	420	Do.
96	16	22	do	58	70	405	do	60	do	9.4	1 1 56	Dec. 24, S. A.,	421	Do.
97	16	22	do	58	70	405	do	80	do	9.1	1 1 51	Dec. 24, S. A.,	422	Very clean after 100 shots.
98	17	22	Bottle	51	85	484	1 cannellure	0	Base	10.6	1 4 18	Jan. 24, F. A.,	1370	"Martini-Henry."
99	17	22	do	51	85	484	do	22	do	12.5	1 5 18	Jan. 24, F. A.,	1371	Do.
100	17	22	do	51	85	484	do	42	do	9.5	1 5 30	Jan. 24, F. A.,	1372	Do.
101	17	22	do	51	85	484	do	62	do	9.6	1 3 18	Jan. 24, F. A.,	1373	Do.
102	17	22	do	51	85	484	do	82	do	8.9	1 4 18	Jan. 24, F. A.,	1374	"Martini-Henry—7 grs. fouling from 102 shots.

Forty-five caliber at 800 yards—targets of 20 shots. Fired from shoulder and rest.

103	8	18	Straight	40	70	400	4 cannellures	0	Brisk from right rear	24.2	2 14 05	Aug. 8, S. A.,	263	1872.
104	16	22	do	50	70	400	do	0	Calm	26.5; 1 miss.	2 31 27	Dec. 7, S. A.,	398	
105	17	22	Bottle	51	85	484	1 cannellure	0	do	24.2; 3 misses.	2 24 39	Dec. 7, S. A.,	397	Martini-Henry.
106	17	22	do	51	85	484	do	0	Light from left rear	20.5; 1 miss.	2 27 38	Dec. 13, S. A.,	408	Do.
107	16	22	Straight	58	70	405	5 cannellures	0	Light from rear	23.0; 2 misses.	2 27 16	Dec. 13, S. A.,	407	Hardened bullet.
108	16	22	do	58	70	405	do	0	Light breeze from left rear	22.2	2 12 30	Jan. 17, S. A.,	433	Do.
109	16	22	do	58	70	405	do	0	do	17.3	2 14 45	Jan. 17, S. A.,	434	Do.
110	16	22	do	58	70	405	do	0	do	19.1	2 13 39	Jan. 17, S. A.,	435	Do.
111	17	22	Bottle	51	85	484	1 cannellure	0	do	19.3; 2 misses.	2 25 45	Jan. 17, S. A.,	436	Martini-Henry.
112	17	22	do	51	85	484	do	0	do	19.5; 3 misses.	2 24 59	Jan. 17, S. A.,	437	Do.
113	17	22	do	51	85	484	do	0	do	17.1; 2 misses.	2 26 11	Jan. 17, S. A.,	438	Do.

TABLE NO. 3.—Forty-five caliber at 1,050 yards—targets of 20 shots. Fired from shoulder and rest—Continued.

Number of target.	Gun.			Ammunition.				Shots since last cleaned.	Wind.	Mean deviation.	Corrected angle.	Date, post, and record number.	Remarks.
	Number.	Twist.	Chamber.	Weight of powder.	Weight of bullet.	Form of bullet.	Lubrication.						
114	8	18	Straight.	40	400	4 cannelures . . .	In cannelures . . .	0	Light from right . . .	57.0 . . .	0	1872.	Hardened bullet. Martini-Henry.
115	16	22	do . . .	58	405	5 cannelures . . .	do . . .	0	Calm . . .	35.2 . . .	3 21 31	Aug. 22, S. A., 265	
116	17	22	Bottle . . .	51	484	1 cannelure . . .	Base . . .	0	do . . .	33.7; 5 misses.	3 34 15 3 26 43	Dec. 16, S. A., 409 Dec. 16, S. A., 417	

TABLE NO. 4.—Angles of sight for trajectories obtained by shoulder-firing at each range.

Ranges, yards.	Corrected angles of sight.						Height of 1,050-yard trajectory in feet at each range.					
	.40" cal.; gun, 13; am., .46.	.42" cal.; gun, 15; am., .49.	.45" cal.; gun, 16; am., .50.	.45" cal.; gun, 16; am., .58.	.45" cal.; "Martini-Henry."	.50" cal.; service.	.40" cal.; gun, 13; am., .46.	.42" cal.; gun, 15; am., .49.	.45" cal.; gun, 16; am., .50.	.45" cal.; gun, 16; am., .58.	.45" cal.; "Martini-Henry."	.50" cal.; service.
100	2 40	10 6	17 17	14 36	24 30	18 0	15.9	18.0	17.3	16.9	16.9	21.2
200	13 45	21 54	24 6	23 56	27 1	30 0	29.9	34.0	33.4	32.2	33.3	40.6
300	27 8	34 4	38 56	41 29	50 10	48 29	41.3	47.8	46.2	43.7	43.9	56.8
400	37 43	53 32	54 45	52 8	1 7 7	1 19 56	51.4	56.9	56.0	54.5	52.6	74.3
500	56 20	1 8 8	1 12 31	1 5 2	1 24 6	1 19 56	56.1	64.7	62.3	62.5	58.4	87.0
600	1 15 26	1 26 23	1 26 23	1 31 41	1 44 21	2 0 51	57.0	68.1	67.4	61.0	59.4	100.0
700	1 32 28	1 47 3	1 46 34	1 49 20	2 0 51	2 19 48	56.4	66.8	66.3	60.5	59.2	127.0
800	1 53 8	2 7 43	2 4 4	2 23 8	2 31 16	3 0 0	50.0	61.9	63.6	45.4	46.5	153.0
900	2 11 22	2 34 27	2 32 1	2 44 22	2 50 19	3 0 0	42.0	48.6	49.6	34.4	37.3	183.0
1,050	3 4 47	3 36 19	3 35 7	3 28 6	3 37 48	3 37 48	0.0	0.0	0.0	0.0	0.0	200.0

TABLE NO. 5.—Forty caliber—pressures and velocities—straight chamber.

Gun.		Ammunition.				Lubrication.	Shots	Degrees, Benton.	Velocity, feet per second.	Pressure, pounds per sq".	Date, post, and record number.	Remarks.
		No.	Caliber.	No.	Weight of powder, grains.	Weight of bullet, grains.						
	18	3	Straight	46	65	340	5 cannelures	23.10	1,384.2	18,500	October 10, F. A., 1358.	
	18	3	do	46	65	340	do	23.05	1,387.2	25,000	do	
	18	3	do	46	65	340	do	23.30	1,372.2	19,000	do	
	18	3	do	46	65	340	do	23.35	1,369.2	19,000	do	
	18	3	do	46	65	340	do	23.00	1,390.2	20,000	do	
	18	3	do	46	65	340	do	22.95	1,393.4	22,000	do	
	18	3	do	46	65	340	do	22.90	1,396.6	21,000	do	
	18	3	do	46	65	340	do	23.10	1,384.2	17,000	do	
	18	3	do	46	65	340	do	22.90	1,396.6	17,500	do	
	18	3	do	46	65	340	do	22.80	1,403.1	20,000	do	
Average									*1,387.7	119,900		
Mean variation in per cent									0.6	8.5		

* 1,434 pounds pressure for every 100 feet velocity.

Forty-two caliber—pressures and velocities—bottle-shaped chambers compared with straight chambers.

STRAIGHT.

Gun.		Ammunition.				Lubrication.	Shots	Degrees, Benton.	Velocity, feet per second.	Pressure, pounds per sq".	Date, post, and record number.	Remarks.
		No.	Caliber.	No.	Weight of powder, grains.	Weight of bullet, grains.						
	18	4	Straight	49	65	370	4 cannelures	24.00	1,330.6	16,500	October 10, F. A., 1357	
	18	4	do	49	65	370	do	24.10	1,325.1	19,000	do	
	18	4	do	49	65	370	do	23.80	1,342.4	17,000	do	
	18	4	do	49	65	370	do	24.00	1,330.6	15,500	do	
	18	4	do	49	65	370	do	24.80	1,286.6	15,500	do	
	18	4	do	49	65	370	do	24.70	1,292.1	16,500	do	
	18	4	do	49	65	370	do	24.30	1,314.1	15,500	do	
	18	4	do	49	65	370	do	24.30	1,314.1	19,000	do	
	18	4	do	49	65	370	do	24.70	1,292.1	13,000	do	
	18	4	do	49	65	370	do	24.60	1,297.6	15,000	do	
Average									*1,312.5	116,250		
Mean variation in per cent									1.25	8.3		

* 80.8 feet velocity for every 1,000 pounds of pressure.

* 1,238 pounds pressure for every 100 feet velocity.

TABLE No. 5.—*Forty-two caliber—pressures and velocities, &c.—Continued.*
BOTTLE-SHAPED.

No.	Gun.		Ammunition.				Lubrication.	Shots	Degrees, Benton.	Velocity, feet per second.	Pressure, pounds per □".	Date, post, and record number.	Remarks.
	Twist	Chamber.	No.	Weight of powder, grains.	Weight of bullet, grains.	Form of bullet.							
21	" 30	Bottle	57	65	370	3 cannelures	In cannelures	1	24.83	1,285.3	17,500	1872. Sept. 27, F. A., 1356	
21	30	do	57	65	370	do	do	2	24.48	1,304.5	17,500	do	
21	30	do	57	65	370	do	do	3	24.43	1,307.3	16,000	do	
21	30	do	57	65	370	do	do	4	24.63	1,296.3	16,500	do	
21	30	do	57	65	370	do	do	5	24.63	1,296.3	17,000	do	
21	30	do	57	65	370	do	do	6	24.58	1,299.0	18,500	do	
21	30	do	57	65	370	do	do	7	24.53	1,301.8	16,000	do	
21	30	do	57	65	370	do	do	8	24.58	1,299.0	15,000	do	
21	30	do	57	65	370	do	do	9	24.98	1,277.0	18,500	do	
21	30	do	57	65	370	do	do	10	25.28	1,261.7	19,000	do	
Average										*1,292.8	†17,150		
Mean variation in per cent.										0.84	6.1		

*1,327 pounds pressure for every 100 feet velocity.

†75.4 feet velocity for every 1,000 pounds of pressure.

Forty-five caliber—pressures and velocities—bottle-shaped chambers compared with straight chambers.

STRAIGHT.

No.	Gun.		Ammunition.				Lubrication.	Shots	Degrees, Benton.	Velocity, feet per second.	Pressure, pounds per □".	Date, post, and record number.	Remarks.
	Twist	Chamber.	No.	Weight of powder, grains.	Weight of bullet, grains.	Form of bullet.							
8	" 18	Straight	50	70	400	4 cannelures	In cannelures	1	23.90	1,336.5	17,500	October 10, F. A., 1359	
8	18	do	50	70	400	do	do	2	24.75	1,289.4	14,000	do	
8	18	do	50	70	400	do	do	3	24.55	1,300.4	15,000	do	
8	18	do	50	70	400	do	do	4	24.70	1,292.1	15,500	do	
8	18	do	50	70	400	do	do	5	24.30	1,314.1	17,500	do	
8	18	do	50	70	400	do	do	6	24.20	1,319.6	19,000	do	
8	18	do	50	70	400	do	do	7	24.70	1,292.1	19,000	do	
8	18	do	50	70	400	do	do	8	24.70	1,292.1	17,500	do	
8	18	do	50	70	400	do	do	9	24.70	1,292.1	15,000	do	
8	18	do	50	70	400	do	do	10	25.05	1,273.2	13,000	do	
Average										*1,300.2	†16,300		
Mean variation in per cent.										1.1	11.0		

*1,254 pounds pressure for every 100 feet velocity.

†79.8 feet velocity for every 1,000 pounds of pressure.

BOTTLE-SHAPED.

Gun.		Ammunition.				Lubrication.	Shot.	Degrees, Benton.	Velocity, feet per second.	Pressure, pounds per sq. in.	Date, post, and record number.	Remarks.
No.	Caliber.	No.	Weight of powder, grains.	Weight of bullet, grains.	Form of bullet.							
5	18	Bottle	56	70	400	3 cannelures	1	24.03	1,329.3	21,000	1872. Sept. 27, F. A., 1355.	
5	18	do	56	70	400	do	2	24.08	1,326.5	19,000	do	
5	18	do	56	70	400	do	3	24.33	1,312.8	18,500	do	
5	18	do	56	70	400	do	4	23.98	1,332.1	20,000	do	
5	18	do	56	70	400	do	5	24.08	1,336.5	18,500	do	
5	18	do	56	70	400	do	6	24.43	1,307.3	17,500	do	
5	18	do	56	70	400	do	7	24.23	1,318.3	15,500	do	
5	18	do	56	70	400	do	8	24.43	1,307.3	19,000	do	
5	18	do	56	70	400	do	9	24.38	1,310.0	17,500	do	
5	18	do	56	70	400	do	10	24.08	1,326.5	18,500	do	
Average.....												
Mean variation in per cent.....												
*1,402 pounds pressure for every 100 feet velocity.												
†71.3 feet velocity for every 1,000 pounds of pressure.												

TABLE NO. 6.—Penetration in white-pine boards at 500 yards—average of ten shots each.

Gun.		Ammunition.				Lubrication.	Range, yards.	Penetration, inches.	Date, post, and record number.	Remarks.
No.	Caliber.	No.	Weight of powder, grains.	Weight of bullet, grains.	Form of bullet.					
1	13	18	46	65	5 cannelures, .02" deep.	In cannelures	500	8.1		Caliber .40".
2	15	20	49	65	4 cannelures	do	500	8.6		Caliber .42".
3	16	22	50	70	do	do	500	6.8		Caliber .45".
4	1	42	1	70	3 cannelures	do	500	7.2		Caliber .50", service.
5	16	22	58	70	5 cannelures	do	500	8.8	December 24, S. A.	Caliber .45", hardened bullet.
6	17	22	51	85	1 cannelure	Base	500	11.2	do	Caliber .45", Martini-Henry.

APPENDIX B.

REPORT ON RIFLE CALIBERS LESS THAN .50" WITH BOTTLE-SHAPED CARTRIDGES.

Third report on small-caliber rifled muskets, .45", .42", and .50", made by Lieutenant William Prince, Ordnance Corps, at Frankford Arsenal, Pennsylvania, January, 1872.

FRANKFORD ARSENAL, PENNSYLVANIA,
January 6, 1872.

MAJOR: Conformably with instructions, I have the honor to submit a general resumé of experiments with rifles and ammunition of calibers less than half inch, made at this post up to the present time.

These experiments consist of upward of two hundred targets with calibers .40", .42", and .45", with various weights of charge and bullet, various twists and forms of rifling, and various systems of patching and lubrication.

Many of these experiments have already been the subject of reports, and others had failed to elicit any facts deemed worthy of notice.

Accuracy of flight and flatness of trajectory have been the only qualities tested, other tests being deferred until these conditions were satisfactorily fulfilled.

Up to this time no superiority in accuracy over the present service caliber has been developed, as will be evident from the following tables of results.

The bullets, except where otherwise described, were in all cases cylindro-conoidal, flat fronted, with three *cannelures*, and generally deviating as little from the service bullet as their altered diameters and weight would admit.

The powder is in all cases "musket;" the cartridge-cases all "bottle-shaped."

Forty-five caliber, (0".45,) 35-inch twist, 3 flat grooves.

EIGHTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	"
400-grain bullet, first.....	6.9	32 54	
second.....	9.3	32 48	
Average.....	8.1	32 51	
420-grain bullet, first.....	9.2	33 36	
second.....	7.8	33 42	
Average.....	8.5	33 39	
440-grain bullet, first.....	9.7	36 54	
second.....	10.9	34 42	
Average.....	10.3	35 48	
General average.....	9.0	34 6	

Forty-five caliber, (0".45,) 35-inch twist, 3 flat grooves—Continued

EIGHTY-GRAIN CHARGES—Continued.

FIVE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	° ' "
400-grain bullet, first		21.0	1 3 36
second		16.4	1 3 18
Average		18.7	1 3 27
420-grain bullet, first		19.8	1 9 24
second		21.7	1 10 30
Average		20.8	1 9 57
440-grain bullet, first		14.5	1 13 6
second		14.2	1 7 42
Average		14.4	1 10 24
General average		17.9	1 7 56

SEVENTY-FIVE-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

	"	° ' "
400-grain bullet, first	7.6	32 48
second	7.5	33 30
Average	7.5	33 9
420-grain bullet, first	9.3	34 24
second	5.7	34 00
Average	7.5	34 12
440-grain bullet, first	7.7	35 48
second	7.5	35 48
Average	7.6	35 48
General average	7.5	34 23

FIVE-HUNDRED-YARD PRACTICE.

	"	° ' "
400-grain bullet, first	13.2	1 6 30
second	10.5	1 6 12
Average	11.9	1 6 24
420-grain bullet, first	17.5	1 11 24
second	12.6	1 8 54
Average	15.0	1 10 9
440-grain bullet, first	14.4	1 15 42
second	13.5	1 10 18
Average	13.9	1 13 00
General average	13.6	1 9 52

Forty-five caliber, (0".45,) 35-inch twist, 3 flat grooves—Continued.

SEVENTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTIC .	Mean absolute deviation.	Corrected angle of sight.
	"	"
400-grain bullet, first.....	7.1	46 42
second	7.9	45 36
Average	7.5	46 9
420-grain bullet, first	7.6	44 48
second	7.9	45 00
Average	7.8	44 54
440-grain bullet, first	8.1	45 18
second.....	7.9	50 12
Average	8.0	47 45
General average	7.8	46 16

FIVE-HUNDRED-YARD PRACTICE.

	"	o / "
400-grain bullet, first.....	12.3	1 21 36
second	13.5	1 22 12
Average	12.9	1 21 54
420-grain bullet, first	14.0	1 20 42
second	11.9	1 19 54
Average	13.0	1 20 18
440-grain bullet, first	13.5	1 24 00
second.....	11.4	1 24 30
Average	12.5	1 24 15
General average	12.8	1 22 9

Forty-five caliber, (0".45,) 23-inch twist, 3 flat grooves.

EIGHTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

	"	"
400-grain bullet, first.....	8.1	31 28
second	8.6	28 35
Average	8.4	30 15
420-grain bullet, first.....	9.4	29 1
second	10.5	28 1
Average	10.0	28 31
440-grain bullet, first.....	9.1	33 40
second	8.2	34 49
Average	8.7	34 15
General average	9.0	31 00

Forty-five caliber, (0".45,) 23-inch twist, 3 flat grooves—Continued.

EIGHTY-GRAIN CHARGES—Continued.

FIVE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	° ' "
400-grain bullet, first.....		12.7	1 5 52
second		26.3	1 5 8
Average		19.5	1 5 30
420-grain bullet, first.....		15.7	1 7 2
second		17.3	1 6 11
Average		16.5	1 6 37
440-grain bullet, first.....		13.3	1 6 52
second		12.7	1 7 24
Average		13.0	1 7 8
General average		16.3	1 16 25

SEVENTY-FIVE-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

	"	' "
400-grain bullet, first.....	8.4	31 16
second	7.6	34 8
Average	8.0	32 42
420-grain bullet, first.....	7.4	29 26
second	7.1	31 41
Average	7.2	30 34
440-grain bullet, first.....	7.9	36 14
second	6.4	34 56
Average	7.1	35 35
General average	7.5	32 57

FIVE-HUNDRED-YARD PRACTICE.

	"	° ' "
400-grain bullet, first.....	15.2	1 8 5
second	9.7	1 6 37
Average	12.5	1 7 21
420-grain bullet, first.....	13.1	1 7 31
second	14.1	1 8 18
Average	13.6	1 7 55
440-grain bullet, first.....	10.6	1 8 31
second	10.9	1 6 32
Average	10.8	1 7 32
General average	12.3	1 7 36

Forty-five caliber, (0".45,) 23-inch twist, 7 ratchet grooves.

EIGHTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	" "
400-grain bullet		11.1	34 16
420-grain bullet		13.3	35 40
440-grain bullet		12.3	42 1
Average		12.2	37 19

FIVE-HUNDRED-YARD PRACTICE.

		"	" "
400-grain bullet		16.0	1 11 25
420-grain bullet		23.9	1 11 40
440-grain bullet		16.4	1 10 53
Average		18.8	1 11 59

SEVENTY-FIVE-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

		"	" "
400-grain bullet		9.9	34 40
420-grain bullet		10.3	36 27
440-grain bullet		9.3	36 18
Average		9.8	35 48

FIVE-HUNDRED-YARD PRACTICE.

		"	" "
400-grain bullet		14.4	1 11 55
420-grain bullet		22.7	1 11 33
440-grain bullet		19.6	1 12 20
Average		18.9	1 11 56

Forty-two caliber, (0".42,) 30-inch twist, 3 flat grooves.

EIGHTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

		"	" "
350-grain bullet, first		15.7	37 26
second		13.6	31 22
Average		14.7	34 24
370-grain bullet, first		12.6	31 56
second		11.9	33 16
Average		12.3	32 36
385-grain bullet, first		13.8	34 42
second		12.9	34 36
Average		13.4	34 39
General average		13.4	33 53

Forty-two caliber, (0".42,) 30-inch twist, 3 flat grooves—Continued.

EIGHTY-GRAIN CHARGES—Continued.

FIVE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	° ' "
350-grain bullet, first		21.1	1 2 37
second		25.7	1 4 24
Average		23.4	1 3 31
370-grain bullet, first		14.7	1 6 27
second		19.3	1 4 58
Average		17.0	1 5 43
385-grain bullet, first		17.9	1 6 26
second		17.5	1 8 36
Average		23.7	1 7 21
General average		21.4	1 5 32

SEVENTY-FIVE-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

	"	° ' "
350-grain bullet, first	11.8	38 35
second	10.3	37 42
Average	11.1	38 19
370-grain bullet, first	6.0	36 28
second	8.3	34 55
Average	7.2	35 42
385-grain bullet, first	10.4	36 00
second	9.6	36 36
Average	10.0	36 18
General average	9.4	36 43

FIVE-HUNDRED-YARD PRACTICE.

	"	° ' "
350-grain bullet, first	22.0	1 11 38
second	19.5	1 11 40
Average	20.8	1 11 39
370-grain bullet, first	17.0	1 9 58
second	20.6	1 5 55
Average	18.8	1 7 32
385-grain bullet, first	21.9	1 8 24
second	27.8	1 9 46
Average	24.8	1 8 45
General average	21.5	1 9 19

Forty-two caliber, (0".42,) 30-inch twist, 3 flat grooves—Continued.

SEVENTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	"
350-grain bullet, first		9.0	39 45
second		8.4	41 35
Average		8.7	40 40
370-grain bullet, first		10.5	39 42
second		8.3	39 6
Average		9.4	39 24
385-grain bullet, first		6.9	39 42
second		6.7	36 48
Average		6.8	38 15
General average		8.3	39 26

FIVE-HUNDRED-YARD PRACTICE.

		"	"
350-grain bullet, first		17.0	1 14 22
second		13.4	1 10 55
Average		15.2	1 12 39
370-grain bullet, first		21.4	1 9 24
second		23.5	1 11 42
Average		22.5	1 10 33
385-grain bullet, first		14.3	1 15 48
second		23.4	1 18 12
Average		18.9	1 17 00
General average		18.9	1 13 24

Forty-two caliber, (0".42,) 20-inch twist, 3 flat grooves.

EIGHTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

		"	"
350-grain bullet, first		9.9	32 34
second		10.4	37 11
Average		10.1	34 53
370-grain bullet, first		10.3	35 53
second		10.6	37 14
Average		10.5	36 34
385-grain bullet, first	} 26 cases out of 40 burst at extractor seat; quit firing.		
second			
Average			
General average		10.3	35 44

Forty-two caliber, (0".42,) 20-inch twist, 3 flat grooves—Continued.

EIGHTY-GRAIN CHARGES—Continued.

FIVE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	° ' "
350-grain bullet, first		27.9	1 11 35
second		27.3	1 12 53
Average		27.6	1 12 14
370-grain bullet, first		30.5	1 10 19
second		27.3	1 12 50
Average		28.9	1 11 35
385-grain bullet, first	{	Could not	use on ac-
second			
Average			
General average		28.3	1 11 55

SEVENTY-FIVE-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

		"	' "
350-grain bullet, first		9.4	36 19
second		7.6	42 16
Average		8.5	39 18
370-grain bullet, first		9.1	37 53
second		7.0	39 29
Average		8.1	38 41
385-grain bullet, first	{	7 cases on t of 17 burst	at extr actor seat—
second			
Average			quit firing.
General average		8.3	39 00

FIVE-HUNDRED-YARD PRACTICE.

		"	° ' "
350-grain bullet, first		20.1	1 14 18
second		27.8	1 15 51
Average		23.9	1 15 5
370-grain bullet, first		25.5	1 13 24
second		17.8	1 11 16
Average		21.6	1 12 25
385-grain bullet, first	{	Could not	use on ac-
second			
Average			bursting at
General average		22.8	extract or seat.

Forty-two caliber, (0".42,) 20-inch twist, 7 ratchet grooves.

EIGHTY-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	"
350-grain bullet.....		12.5	37 31
370-grain bullet.....		15.0	36 17
385-grain bullet.....		12.8	39 14
Average		13.5	37 41

FIVE-HUNDRED-YARD PRACTICE.

		"	0 1 "
350-grain bullet.....		23.8	1 10 20
370-grain bullet.....		28.5	1 9 34
385-grain bullet.....		23.9	1 10 5
Average		25.4	1 7 20

SEVENTY-FIVE-GRAIN CHARGES.

THREE-HUNDRED-YARD PRACTICE.

		"	"
350-grain bullet.....		11.7	41 25
370-grain bullet.....		10.5	41 29
385-grain bullet.....		8.4	40 41
Average		10.2	41 12

FIVE-HUNDRED-YARD PRACTICE.

		"	0 1 "
350-grain bullet.....		21.2	1 10 37
370-grain bullet.....		23.9	1 12 9
385-grain bullet.....		19.3	1 13 35
Average		21.5	1 12 7

Forty caliber, (0".40,) 24-inch twist, 5 flat grooves, (smooth cylinder, ellipsoidal patched bullet.)

EIGHTY-GRAIN CHARGES.

FIVE-HUNDRED-YARD PRACTICE.

		"	0 1 "
350-grain bullet, first.....		20.4	1 6 48
(Smooth patched,) second.....		23.6	1 7 13
third.....		22.2	1 4 43
Average		22.1	1 6 15

SEVENTY-FIVE-GRAIN CHARGES.

FIVE-HUNDRED-YARD PRACTICE.

		"	0 1 "
350-grain bullet, first.....		17.2	1 13 48
(Smooth patched,) second.....		19.6	1 9 41
third.....		16.8	1 9 40
Average		21.9	1 11 23

Forty caliber, (0".40,) 18-inch twist, 5 flat grooves.

EIGHTY-GRAIN CHARGES.

FIVE-HUNDRED-YARD PRACTICE.		Mean absolute deviation.	Corrected angle of sight.
		"	° ' "
350-grain bullet, first.....		19.8	1 12 3
(Smooth patched,) second.....		23.2	1 3 13
third.....		21.1	1 2 34
Average.....		21.4	1 5 27

SEVENTY-FIVE-GRAIN CHARGES.

FIVE-HUNDRED-YARD PRACTICE.

		"	° ' "
350-grain bullet, first.....		16.0	1 11 57
(Smooth patched,) second.....		17.5	1 7 34
third.....		14.3	1 3 7
Average.....		15.9	1 7 33

So far as these experiments go they appear to indicate that—

1st. The .45" caliber is preferable to less calibers.

2d. The 24" twist is preferable to 30" twist for .45" calibers.

3d. Flat grooving is preferable to ratchet grooving.

4th. The 75 grain charge is preferable to 80 or 70 grains.

5th. The heavier bullets are preferable to the lighter ones.

6. The performance generally is not superior in accuracy to the service-ammunition, caliber .50", though the flatness of trajectory is, of course, greater for 500 yards, the charge being heavier and the bullet lighter.

The average performance of service-ammunition is, for—

300 yards: Mean absolute deviation.....	7".1
Angle of sight.....	49'.0
500 yards: Mean absolute deviation.....	13".1
Angle of sight.....	1° 19'

The above facts, however, it must be borne in mind, apply only to the limited number of combinations tried so far among the numberless permutations which may be wrought upon the variables concerned. There may undoubtedly be combinations that will produce results superior in all respects to any so far obtained.

The bullets used in all of these trials, except those with .40" caliber, were flat fronted and supplied with three *cannelures* for side lubrication, without patch.

It was hoped that the end might be attained, without introducing any of the difficulties and objections incident to patched ammunition.

These difficulties are—1st, that patching the bullet is an operation which it will be scarcely possible to accomplish by machinery; and, 2d, that base lubrication by disks of lubricant and wads involves several operations not required in fabricating the present service-cartridge.

The objections are, 1st, the necessity for dispensing with the indenting of the copper case in the lead of the bullet, which contributes to the water-proof quality of the present service-ammunition; and, 2d, the increased length of cartridge incident to base lubrication.

As, however, many of the most successful systems of metallic ammunition are constructed on these principles, the trials will, unless otherwise directed, be extended over this ground, and cartridges are now being prepared to test the qualities of base lubricated bullets in calibers .50", .45", and .42".

Patched and base lubricated ammunition of .40" cal. seems to be sufficiently disposed of by the results herein reported.

Respectfully submitted.

WM. PRINCE,
Lieutenant of Ordnance.

Major T. J. TREADWELL,
Ordnance Department, Commanding.

FRANKFORD ARSENAL, PENNSYLVANIA,
January, 1872.

Respectfully forwarded to the Chief of Ordnance for his information.

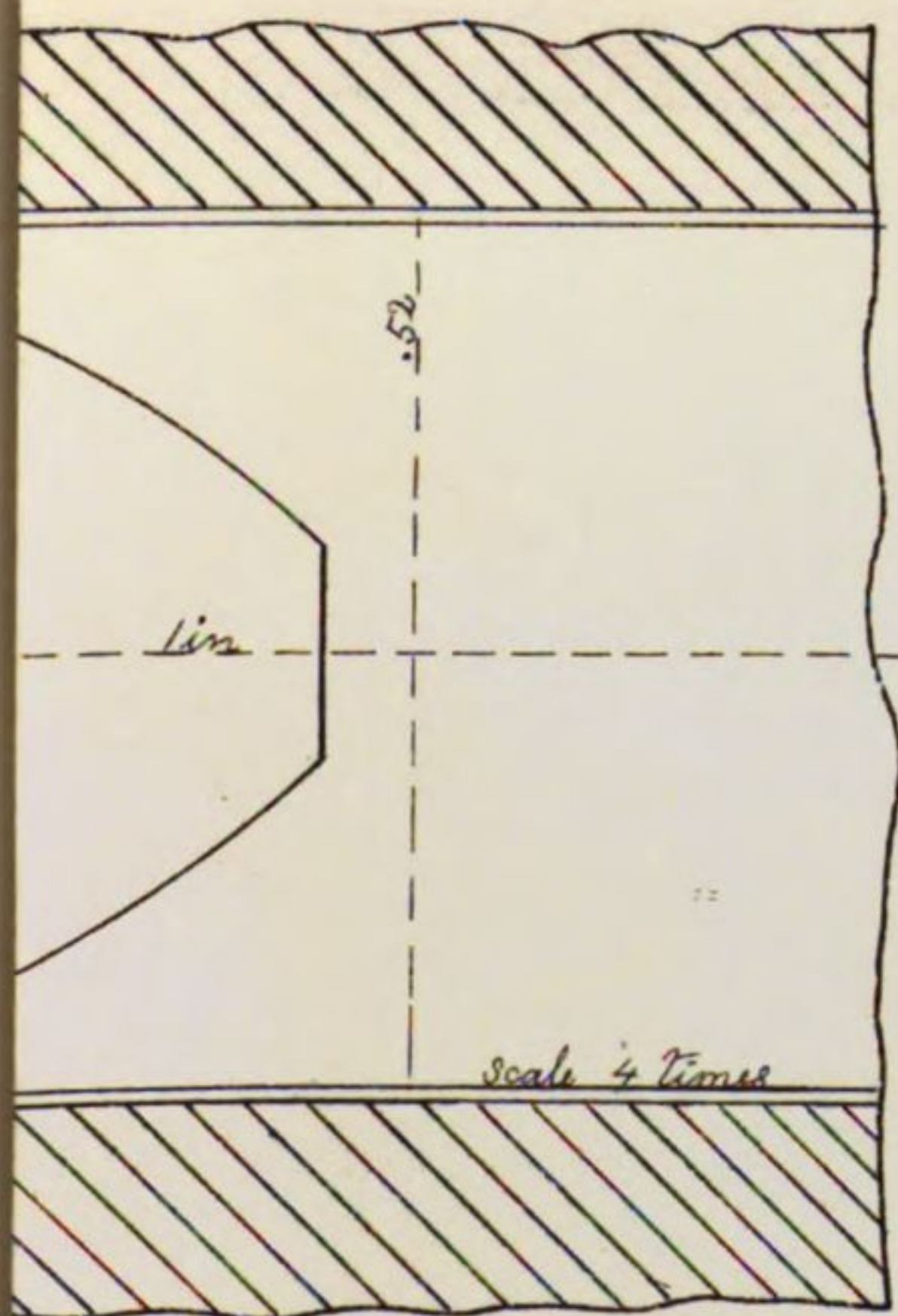
T. J. TREADWELL,
Major of Ordnance, Commanding.

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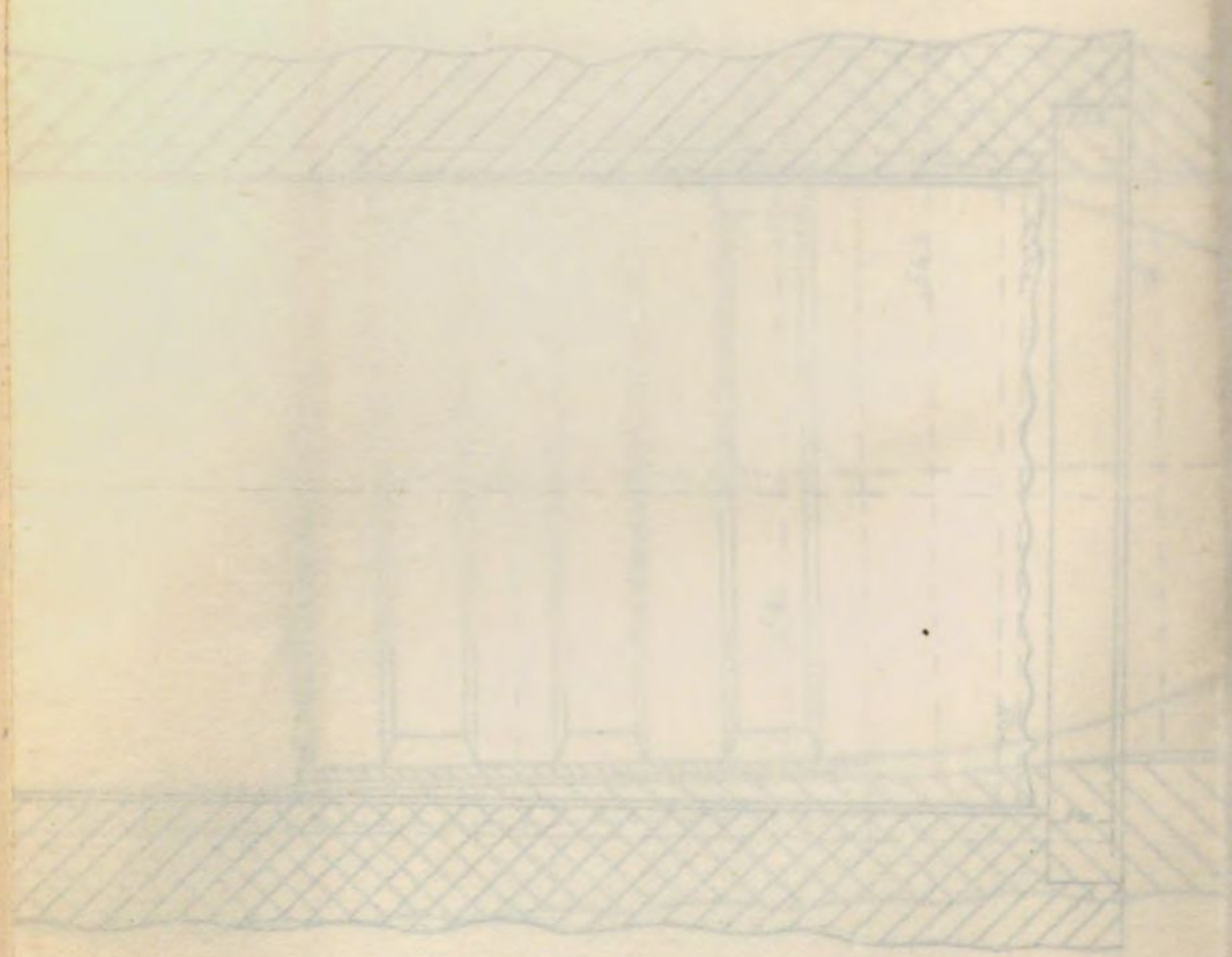
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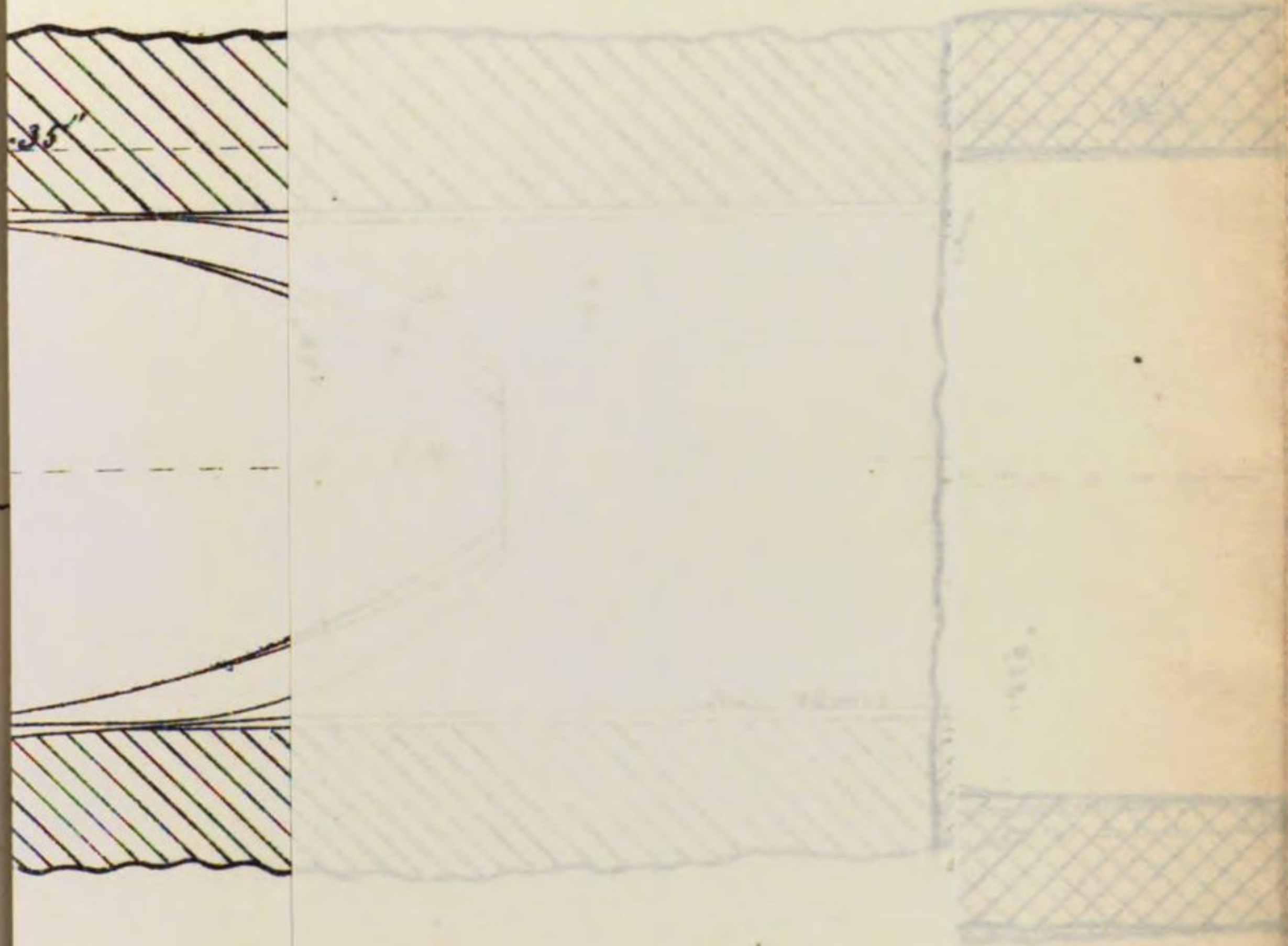
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*Sketch of the interior of the
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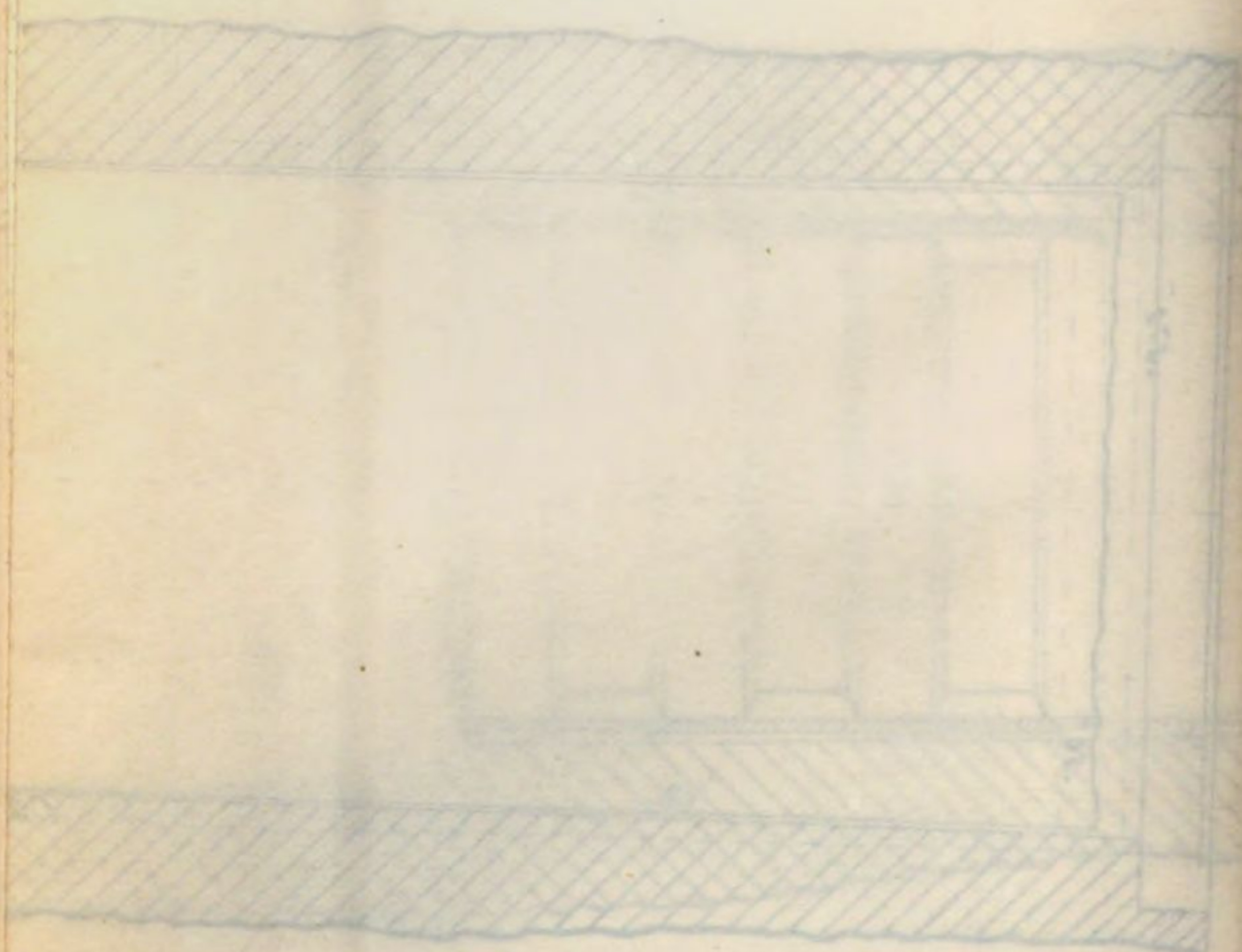


*Appendix A
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Appendix to the Report of the
 "Small Arms" Committee
 1884-85
 December

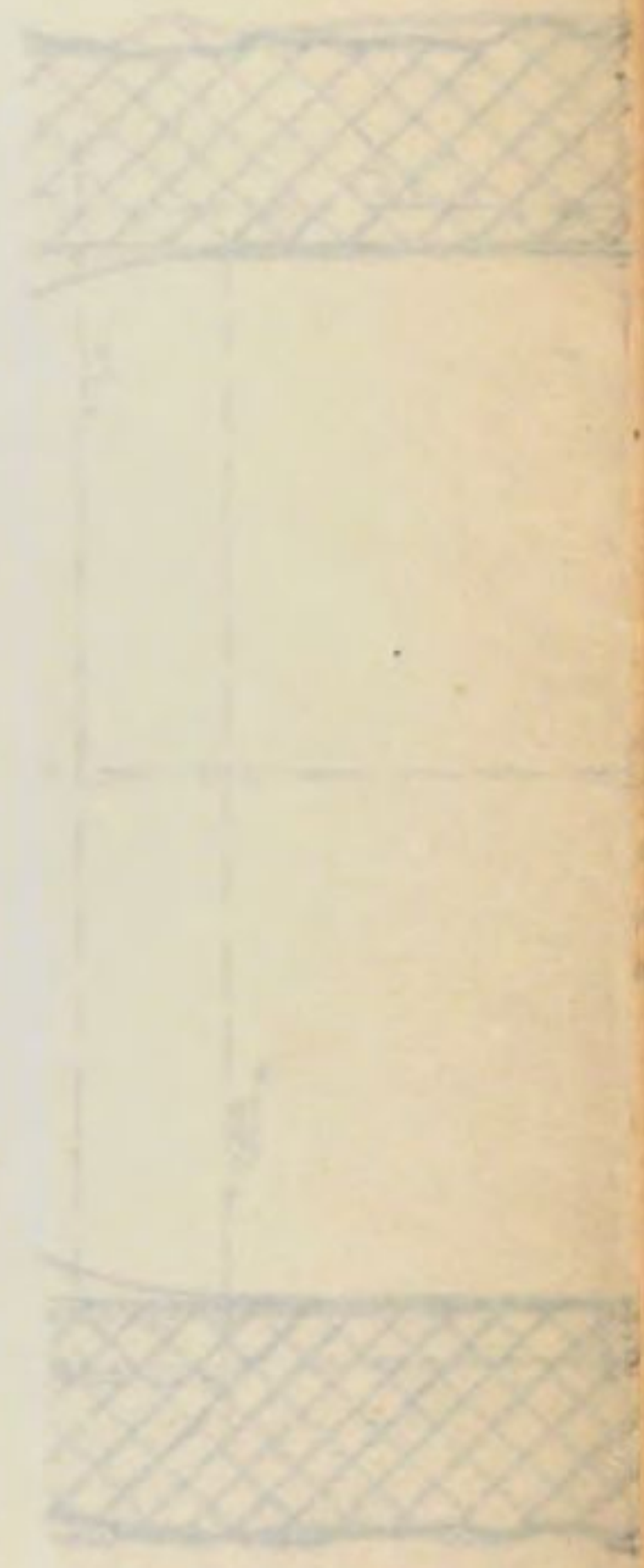
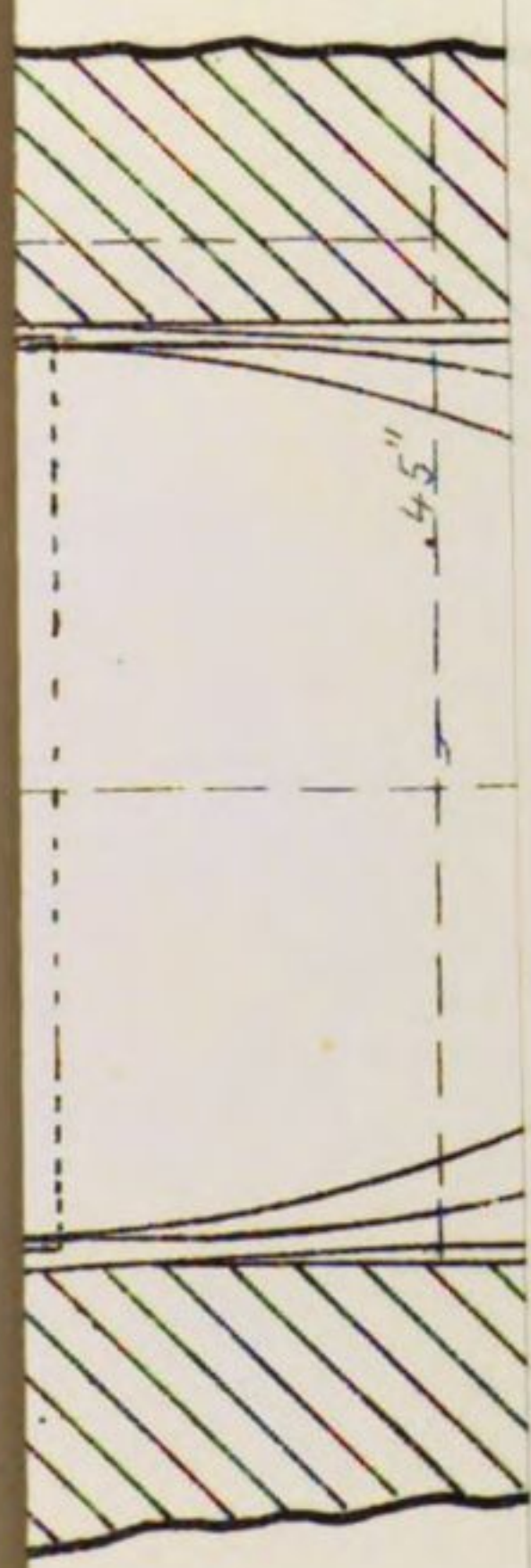


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Appendix A
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Proceedings of the
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No. 2
Number of Gun No. 2
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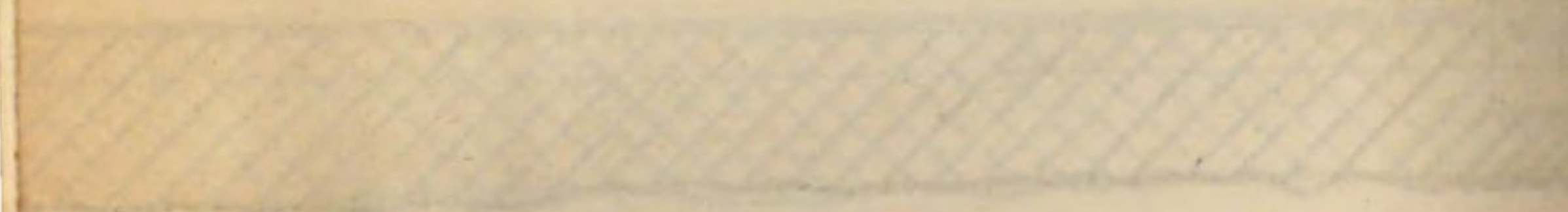
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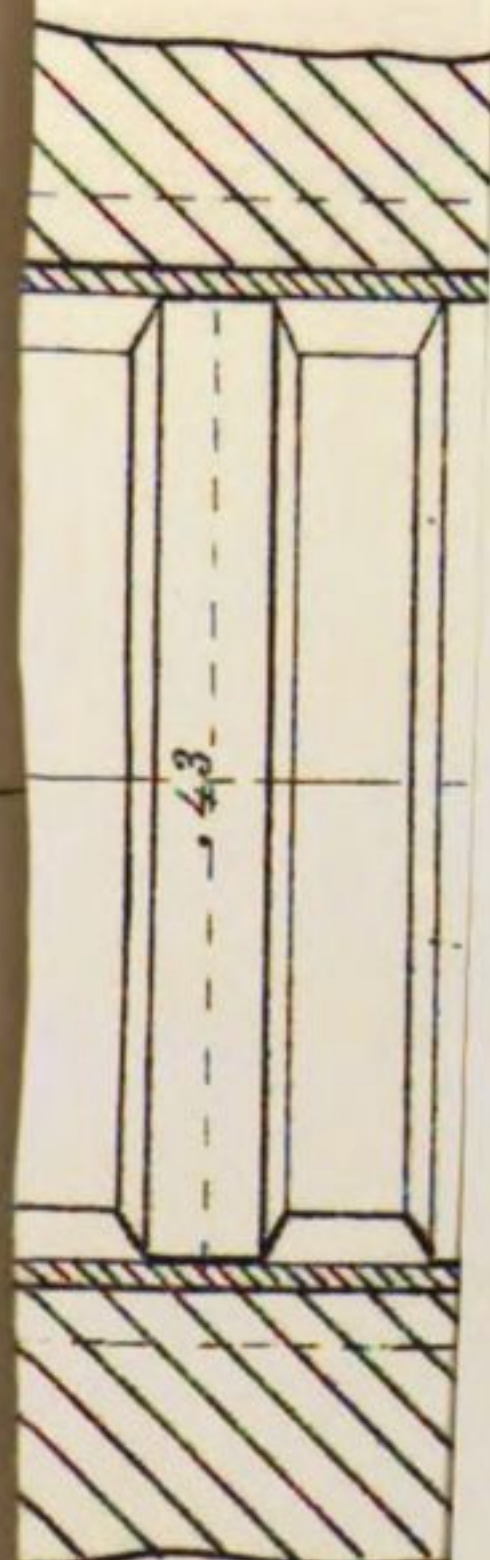
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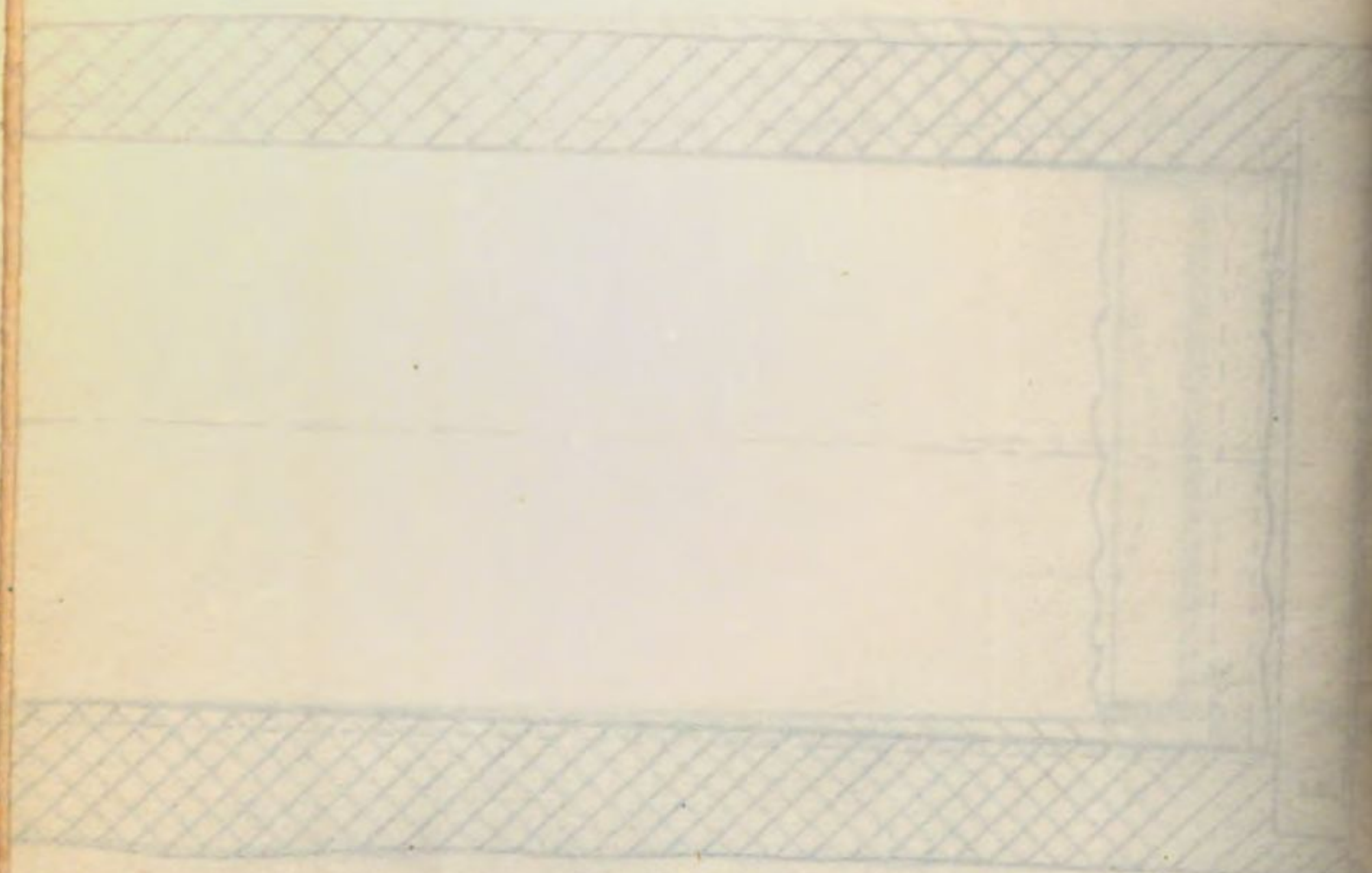
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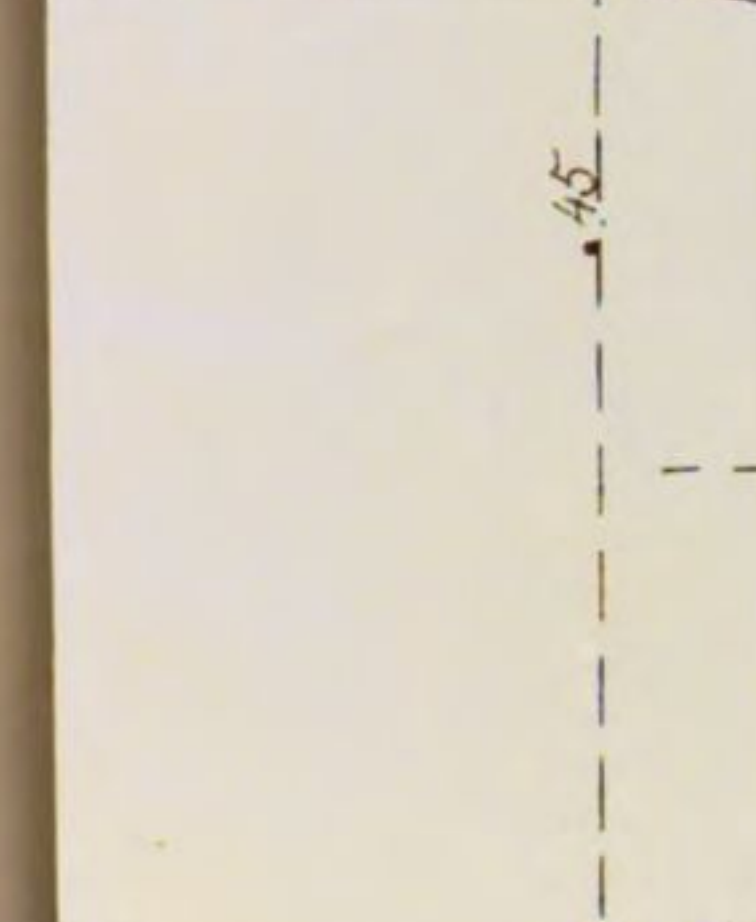
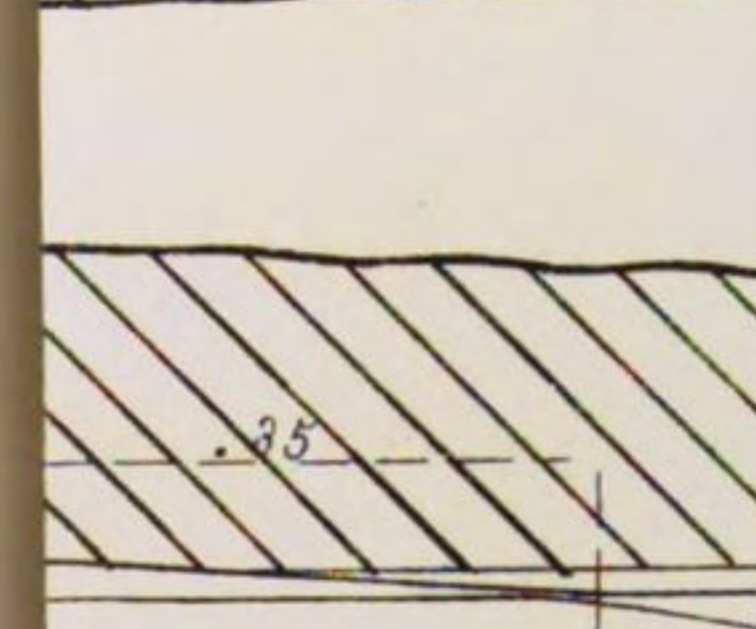
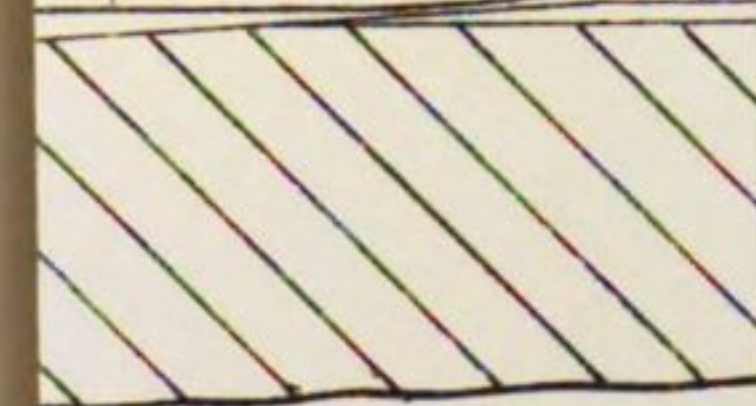
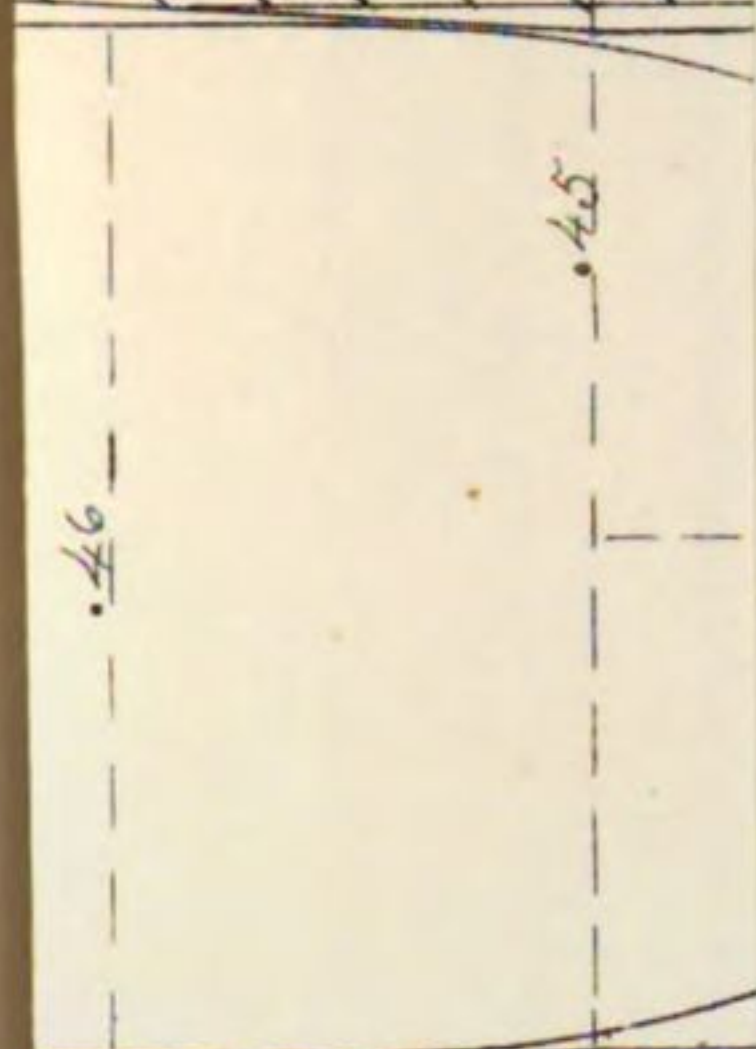
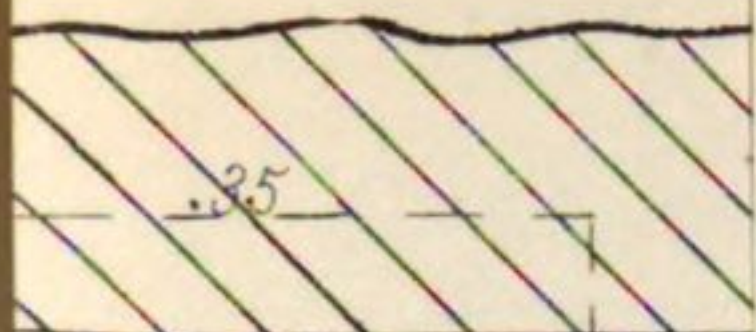
Sections 20, 21, 22 & 23



Appendix A. D.

Section Area C.

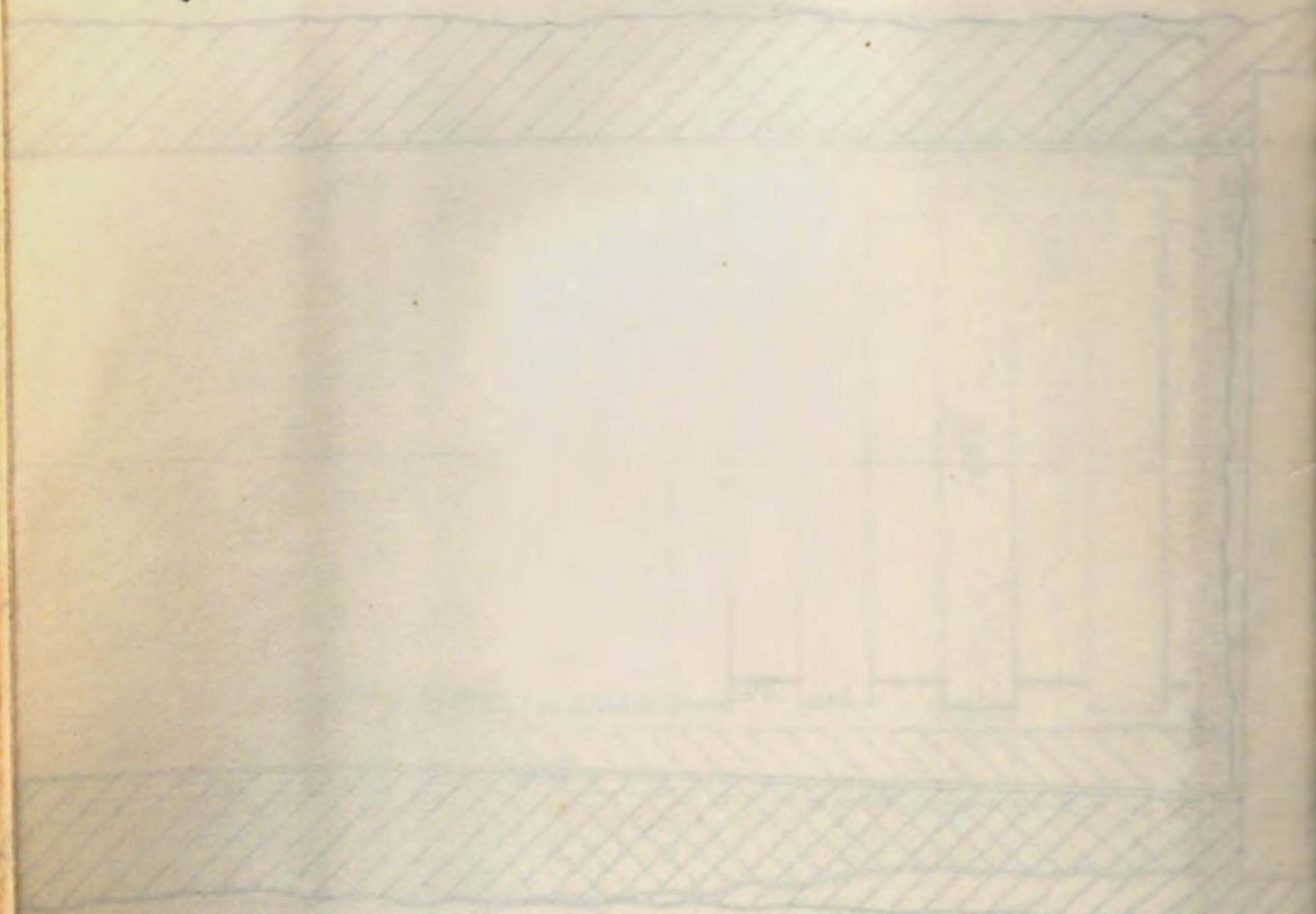
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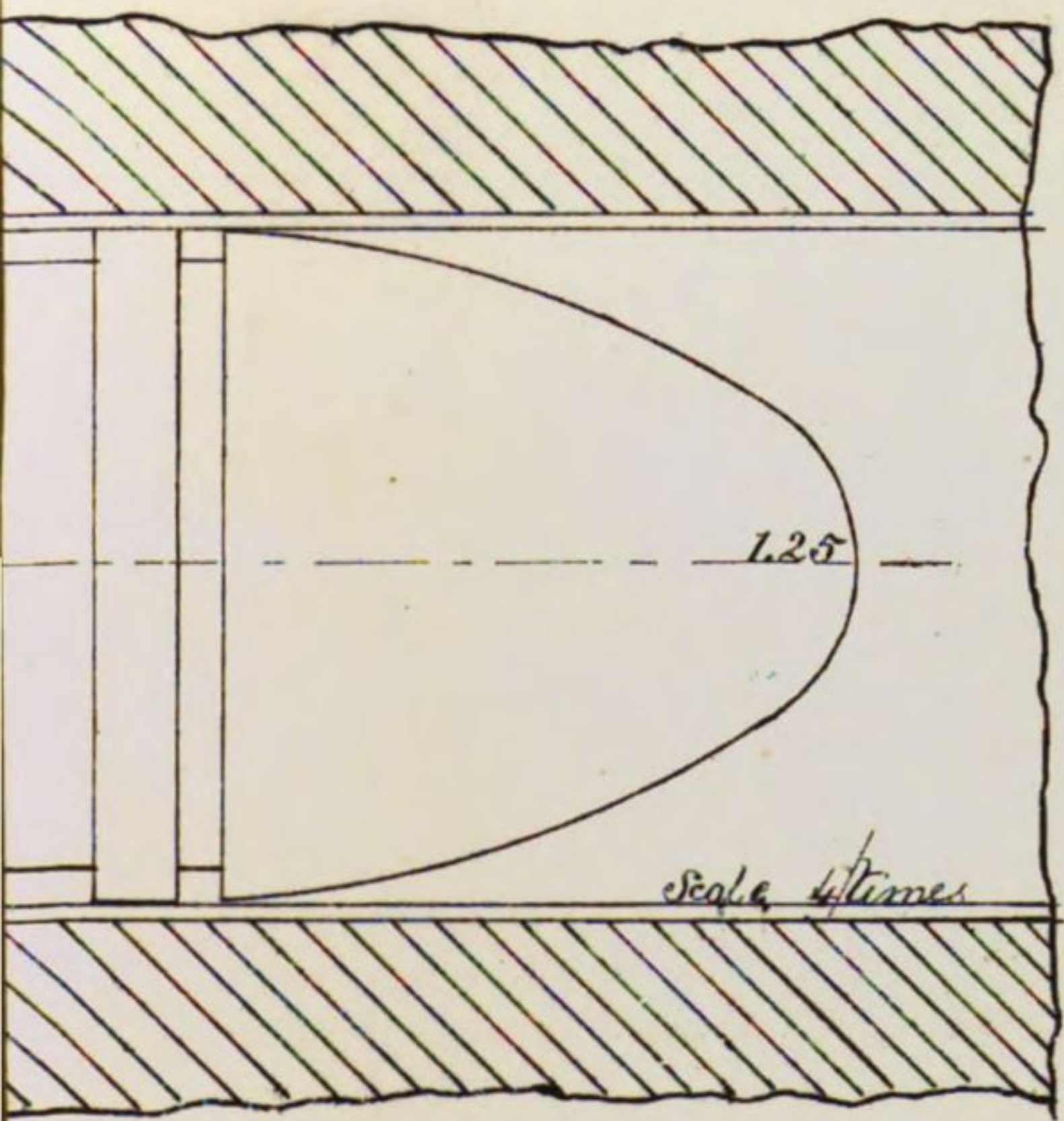
The Timber Market
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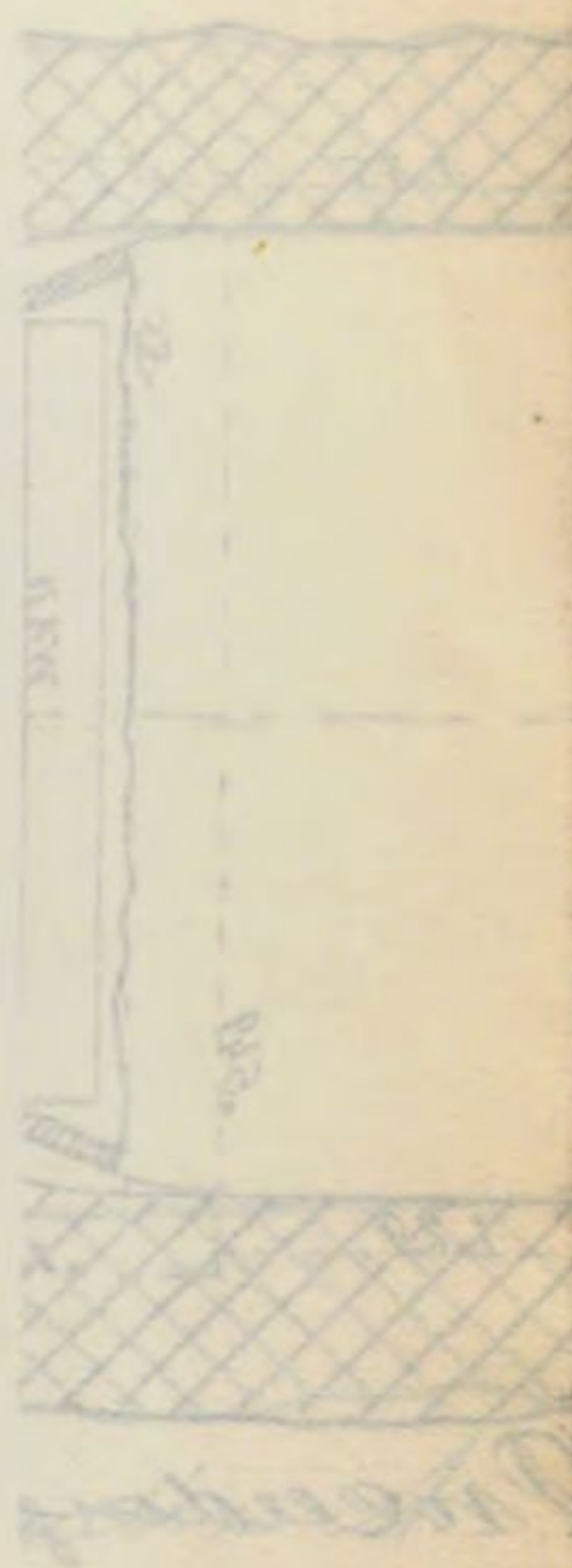


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J. J. Prince & Co.
New York

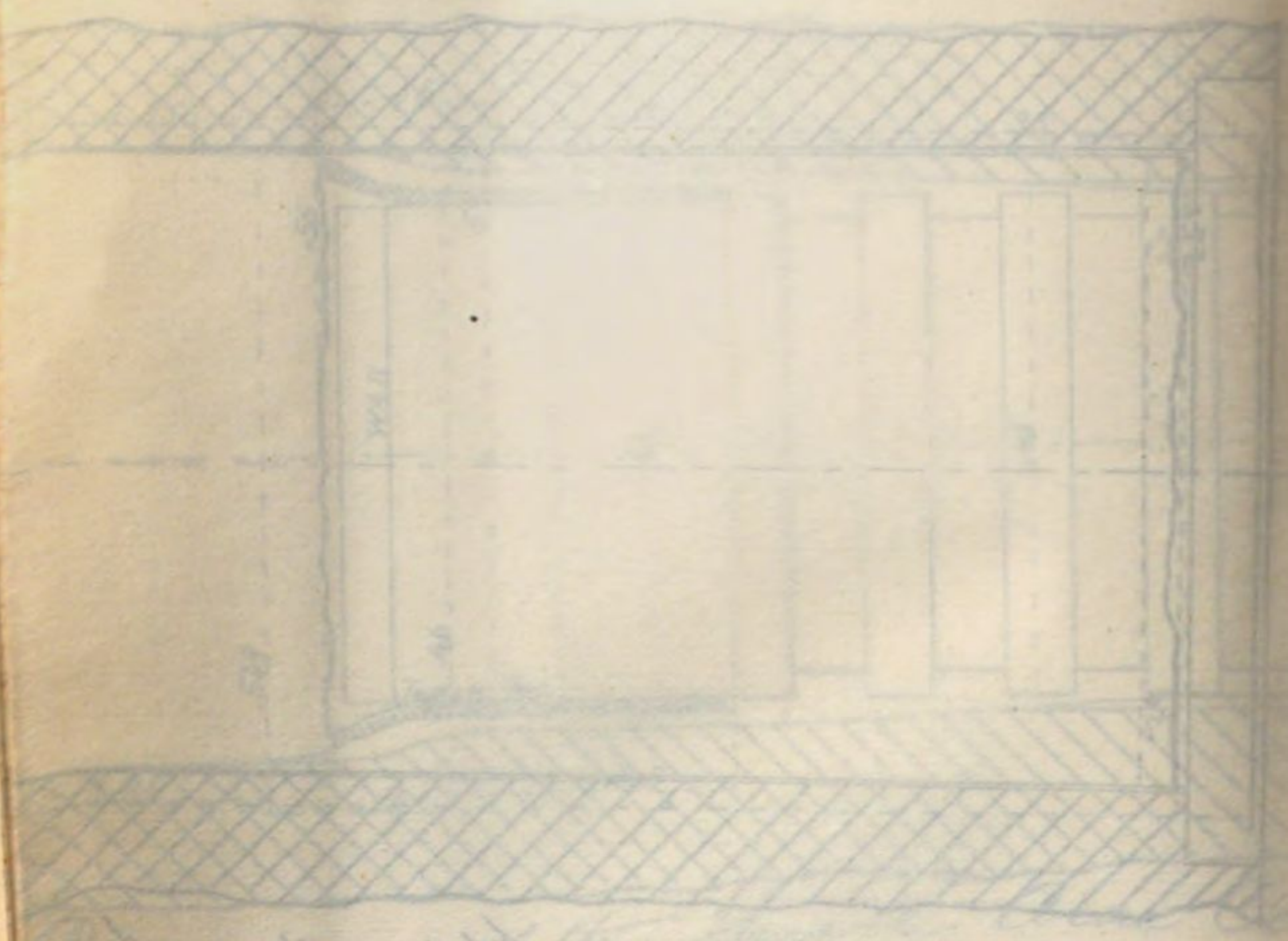
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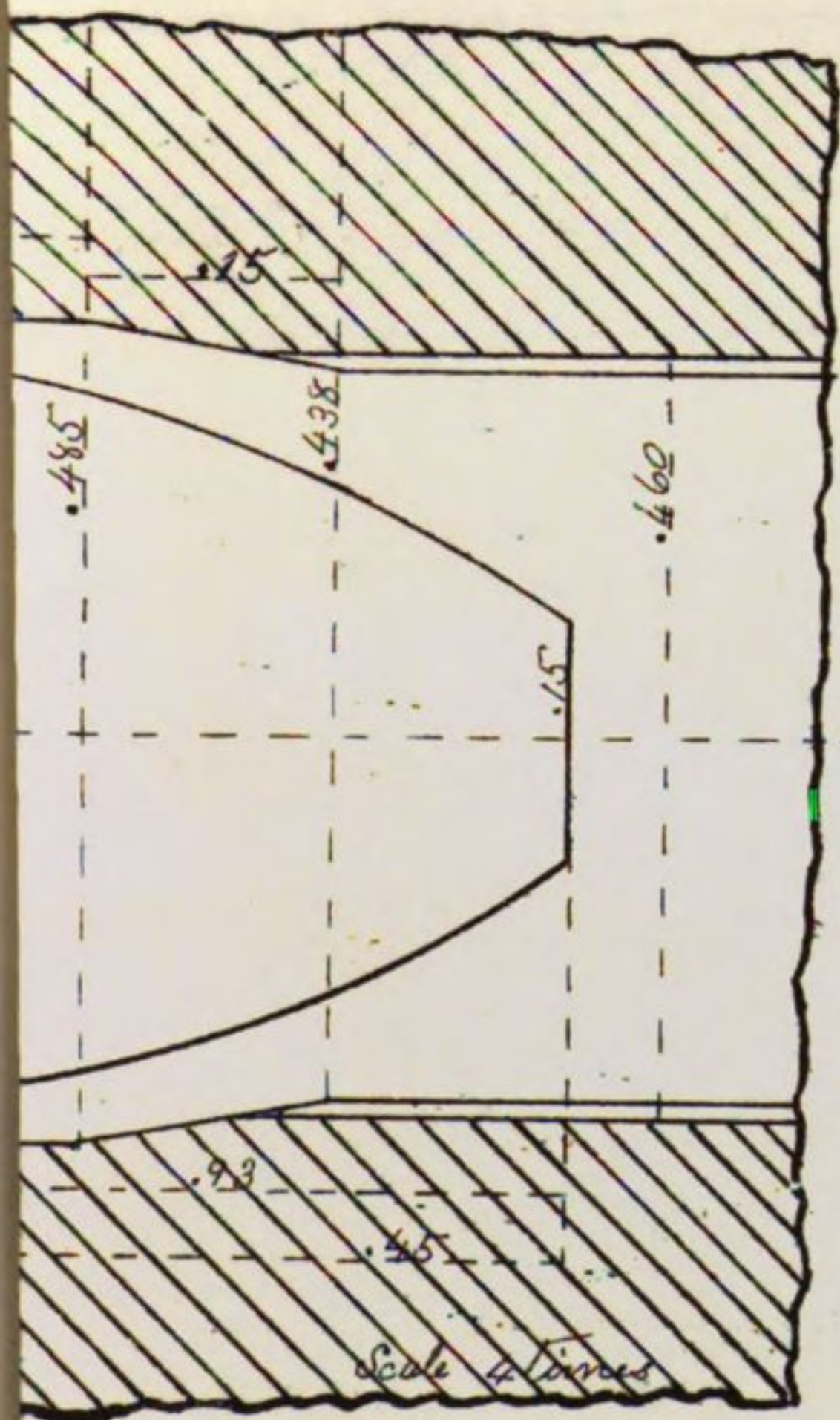
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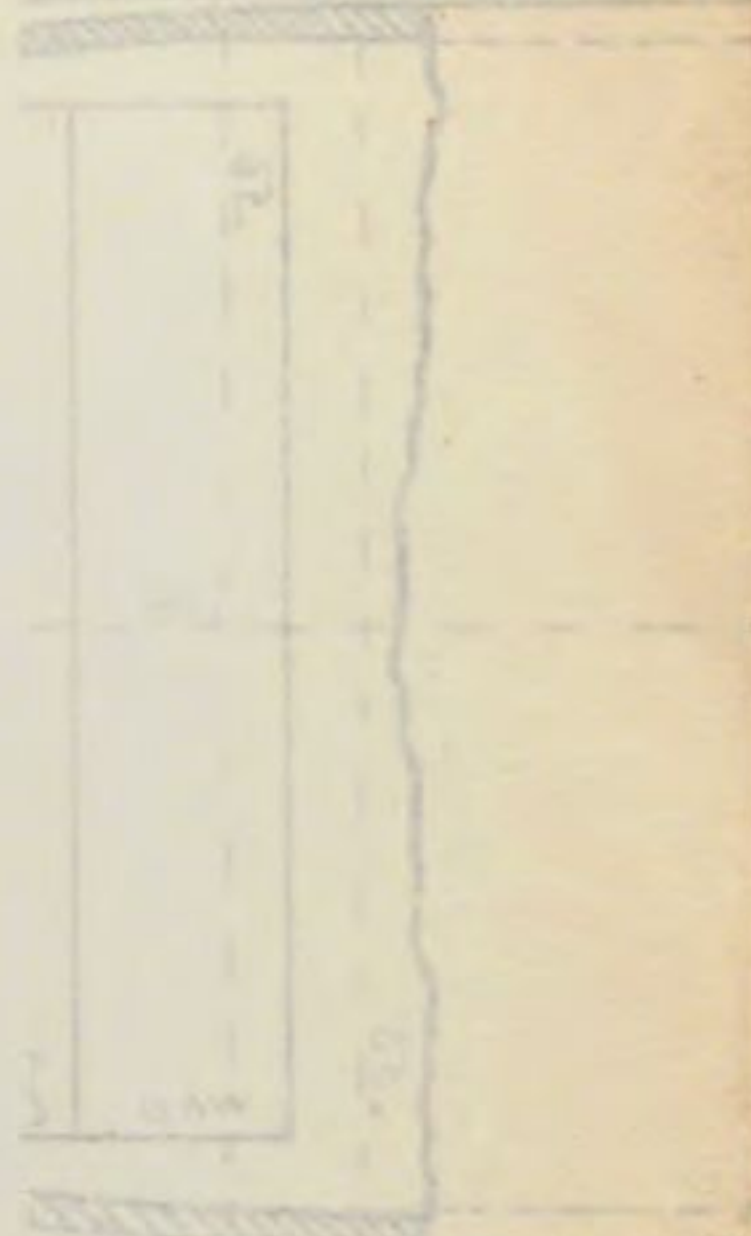
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Dep. 1029 in front



Dep. 1005
Dep. 1029 in front
Dep. 1005
Dep. 1029 in front



and No. 10
in position



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of

SECTION 10-10

Fig 10 - Chamber of
 Venturini No 3

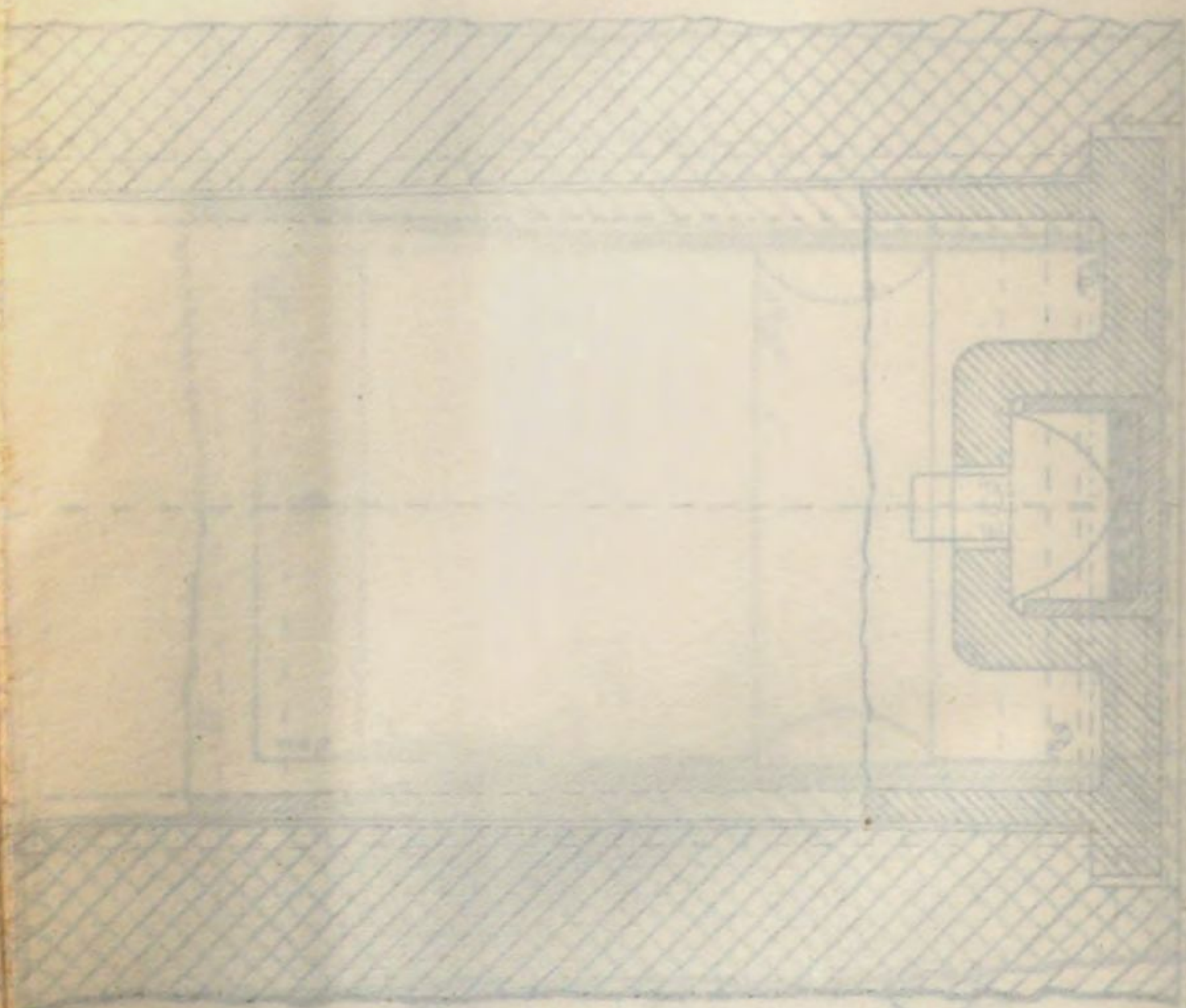
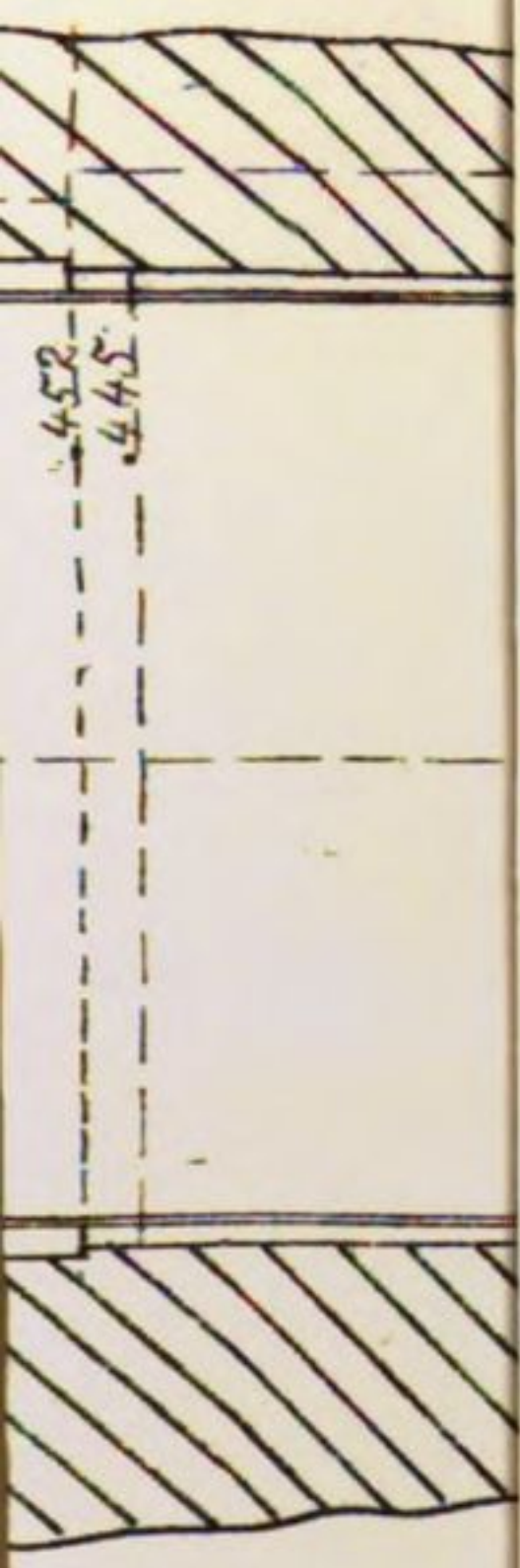


Fig 10 - Chamber of Venturini No 3
 The drawing is a cross-section of a chamber, showing the internal structure and the hatched material surrounding it.

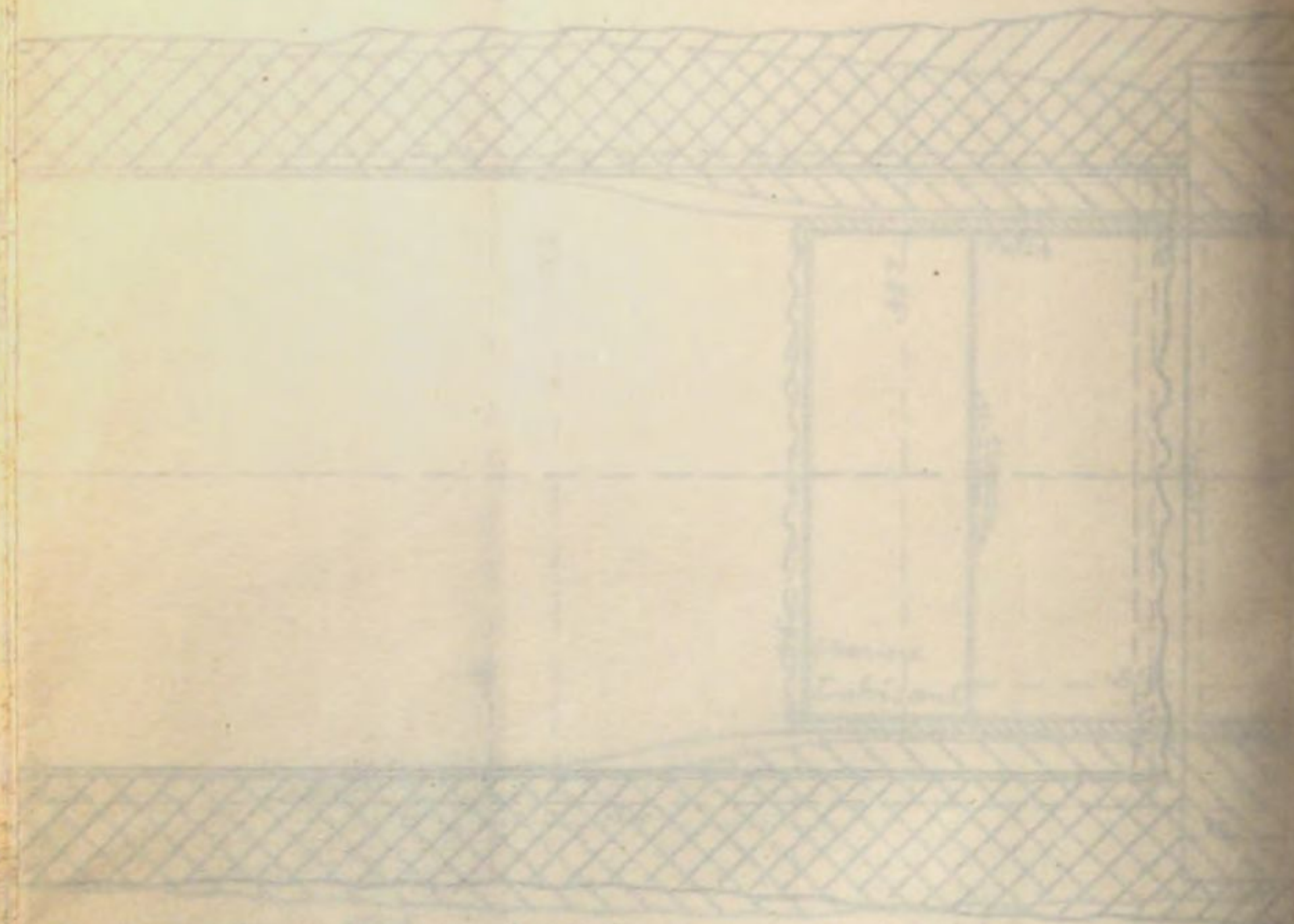
W. (Glen)
C. (Dart)



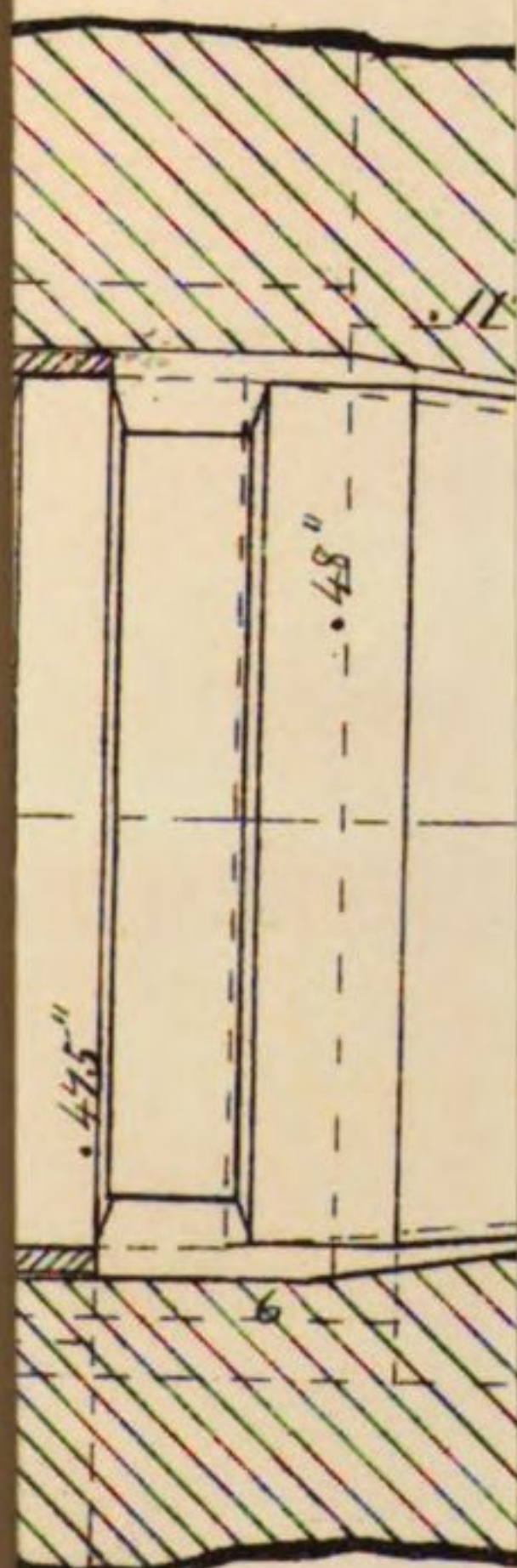
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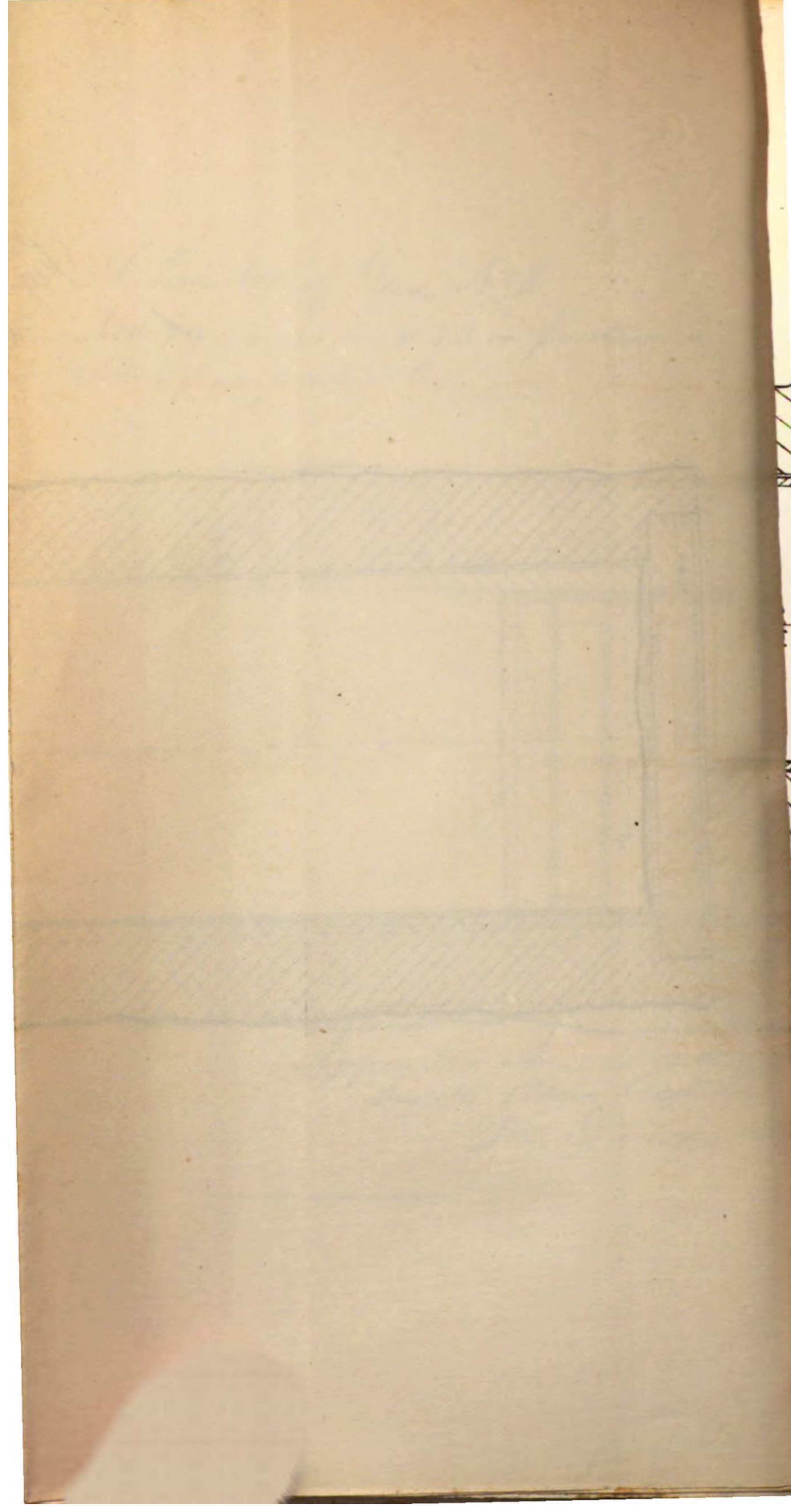
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 2. *in position*



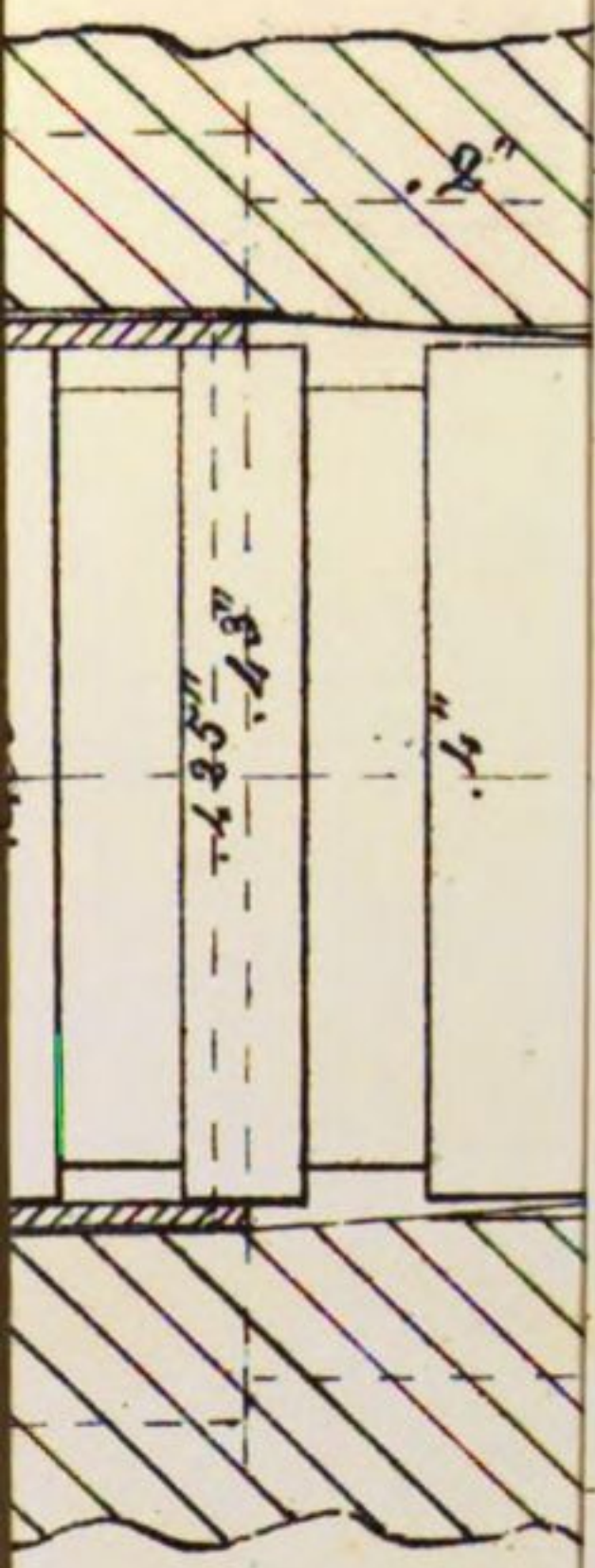
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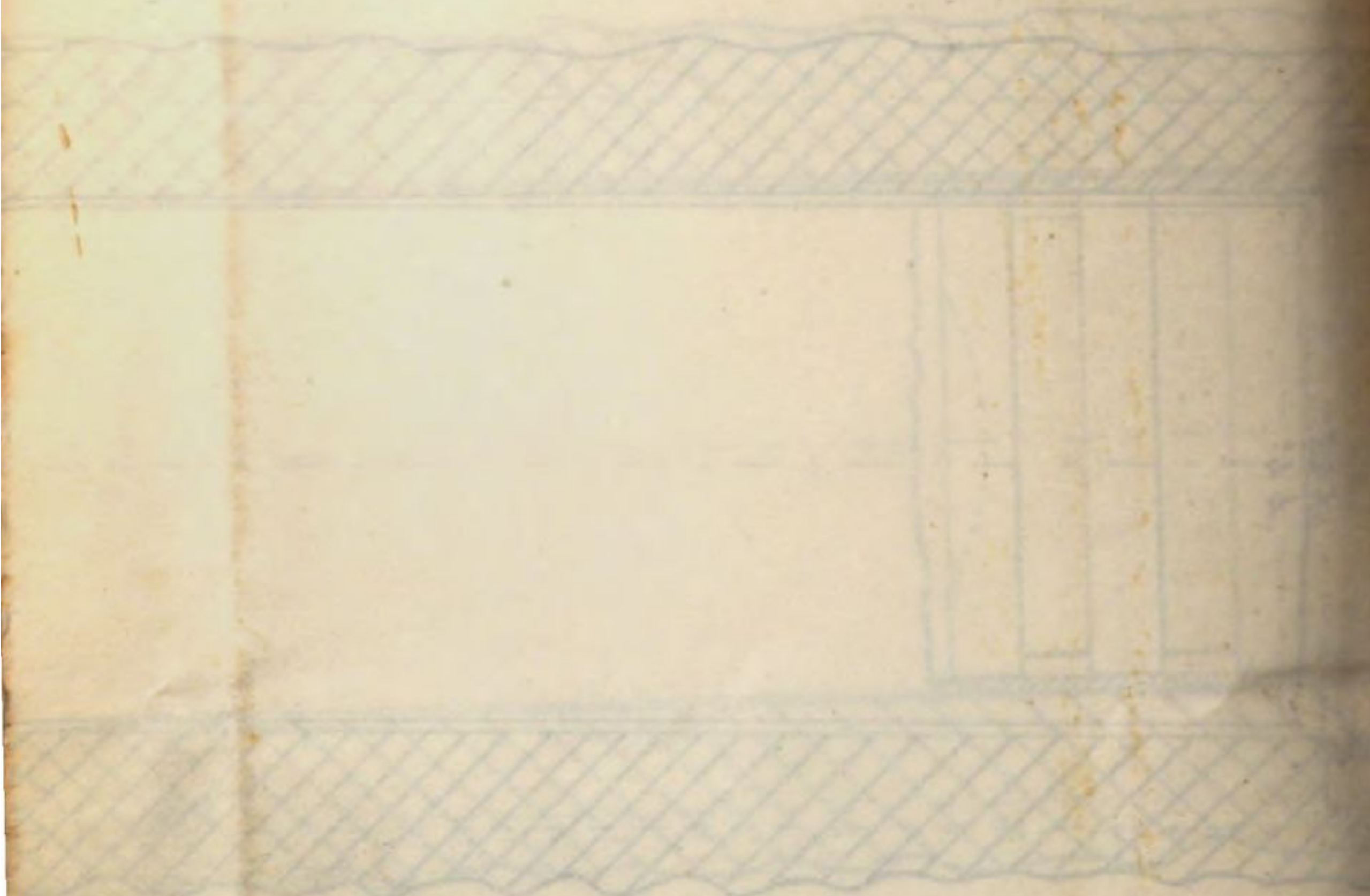


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Board
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Fig 13. Chamber of Cuv. No 14
containing No 15 in position



Appendix A. F.
Small. Above. Cal.
H. P.

No 13

Section

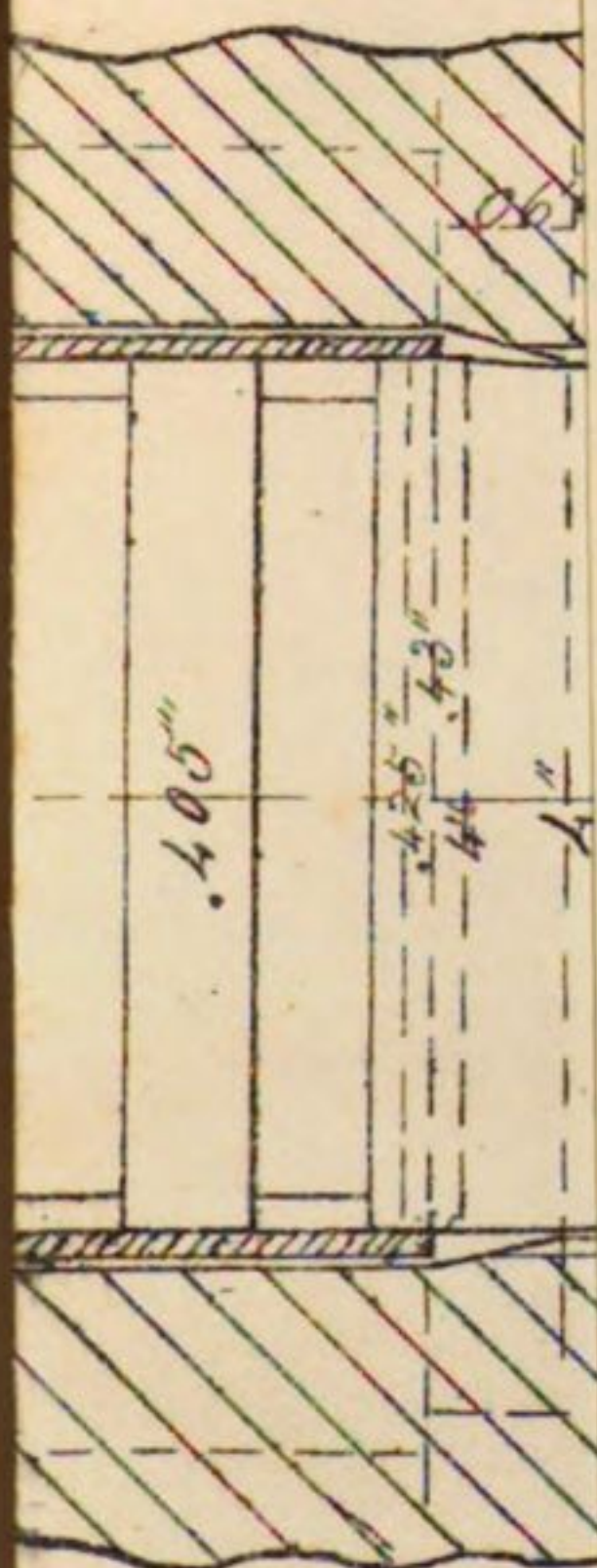


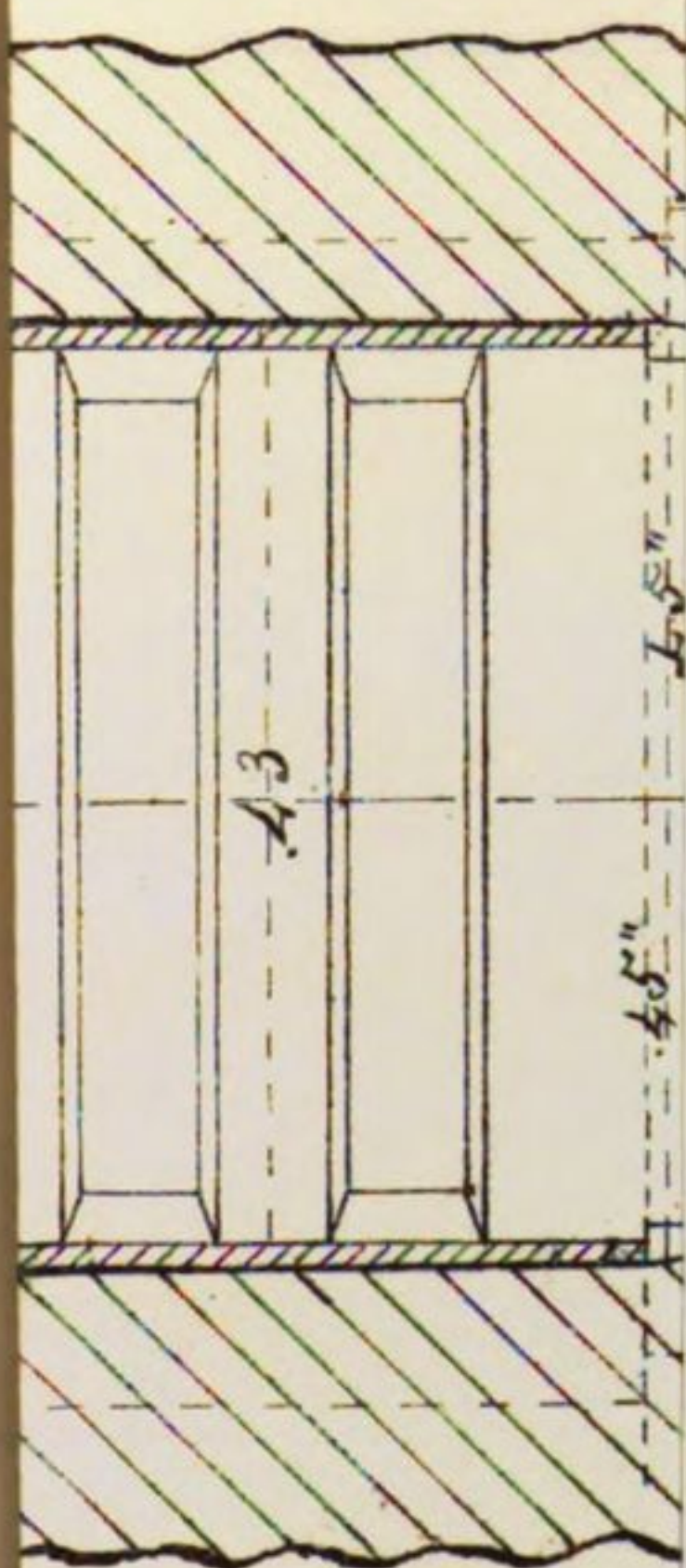
Fig A. D.
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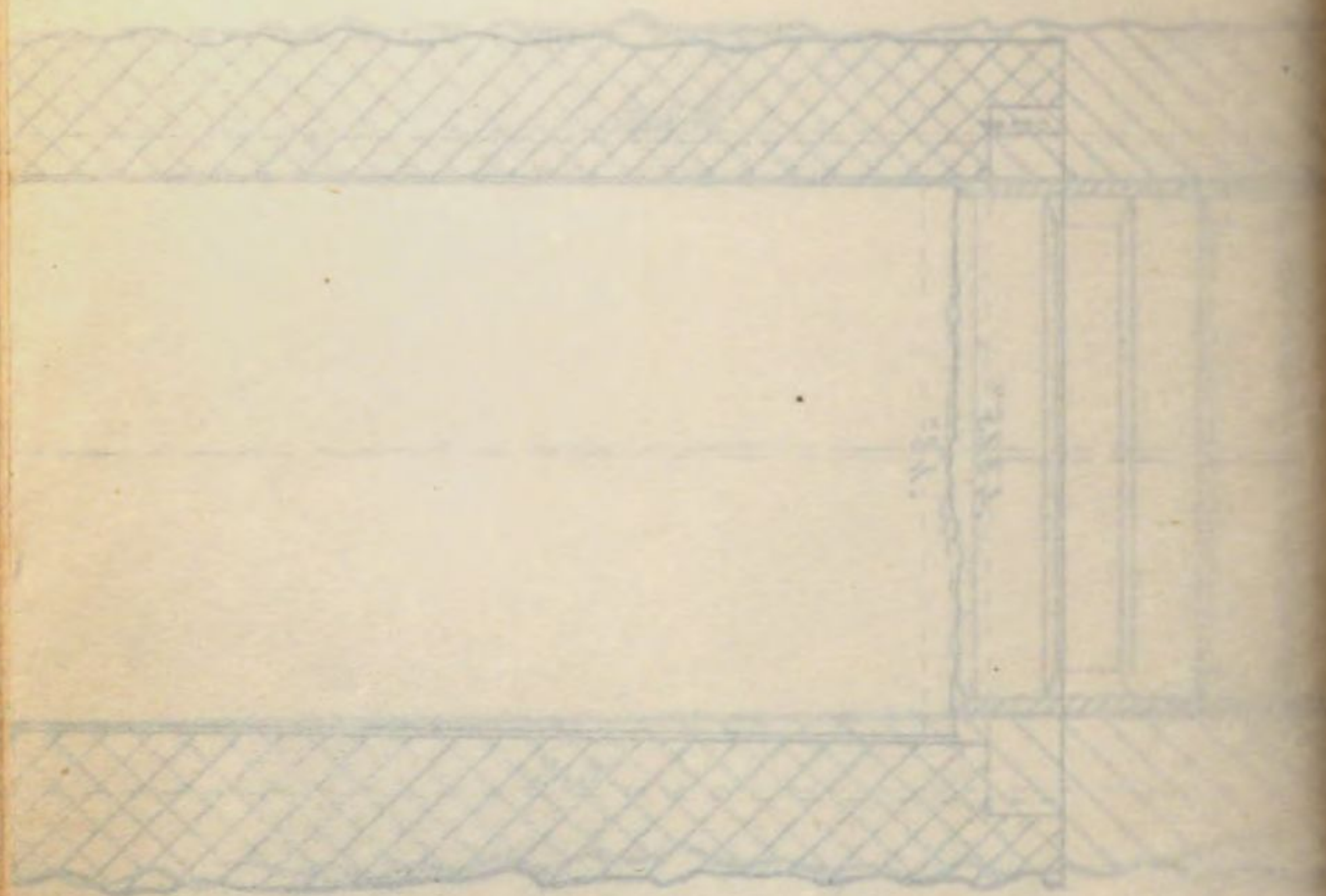


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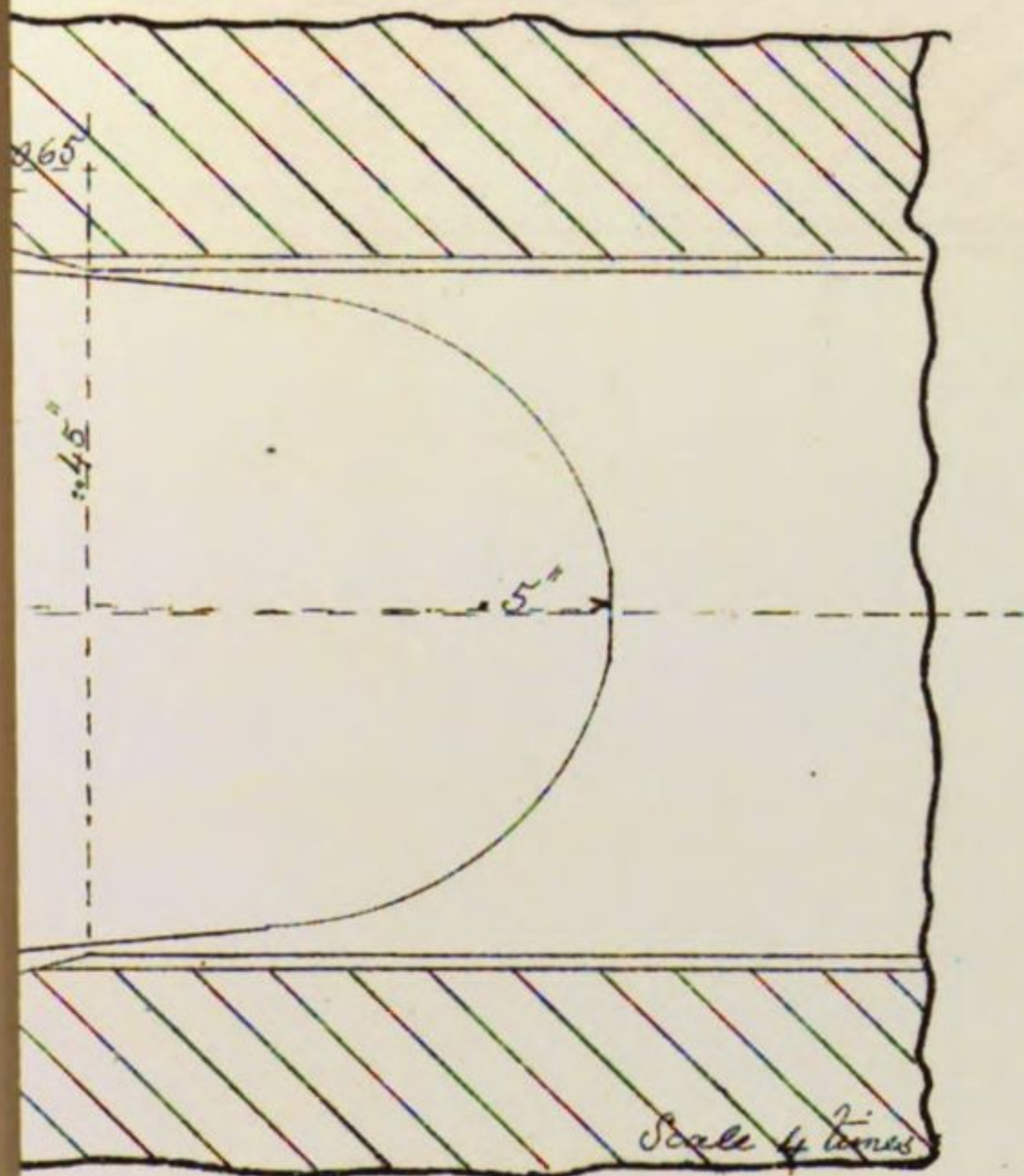
Case No 15
54255
Embroidery No 29. in position



Appendix No
Small

No 15

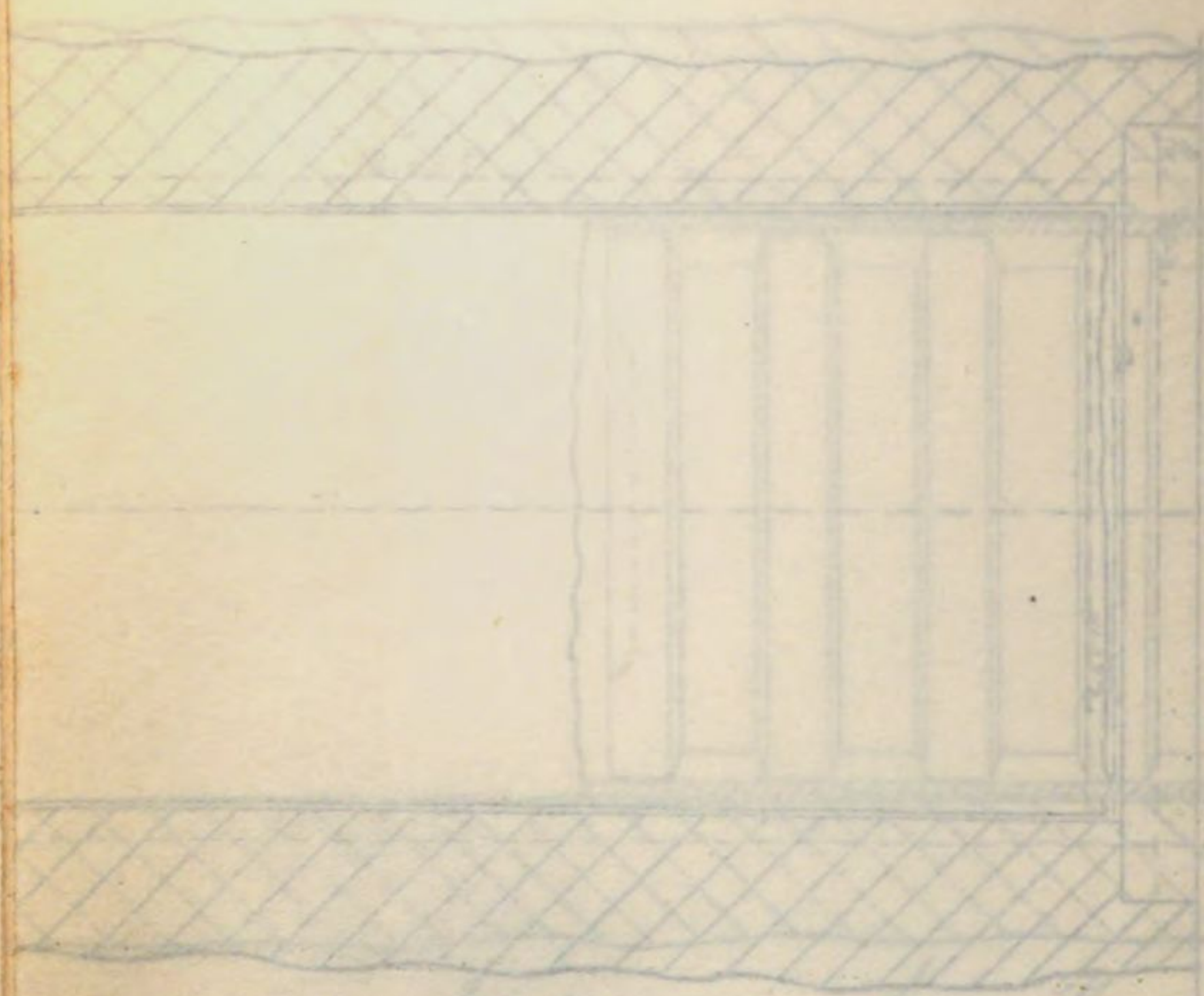
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Lot Ord. Recorder

Fig 16. Chamber of Gun
 Cartridge No. 50 in p



Appendix A. Shored
 Small Arm Cartridge
 No. 50 in p

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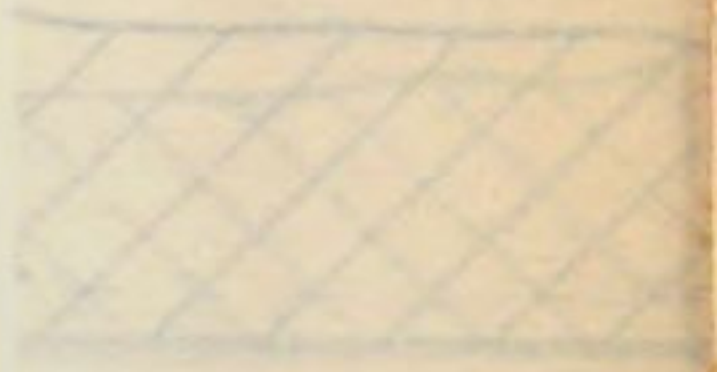
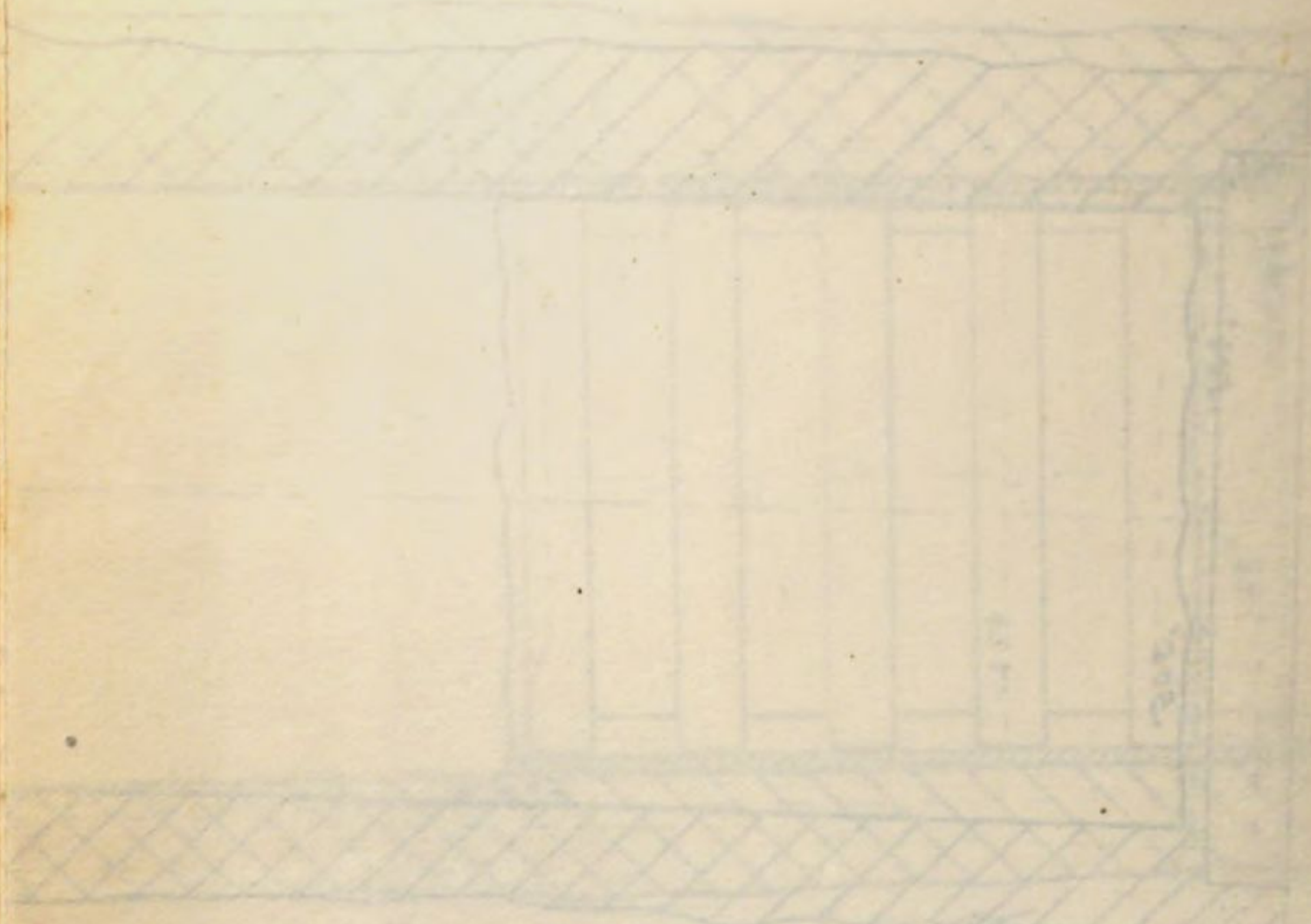
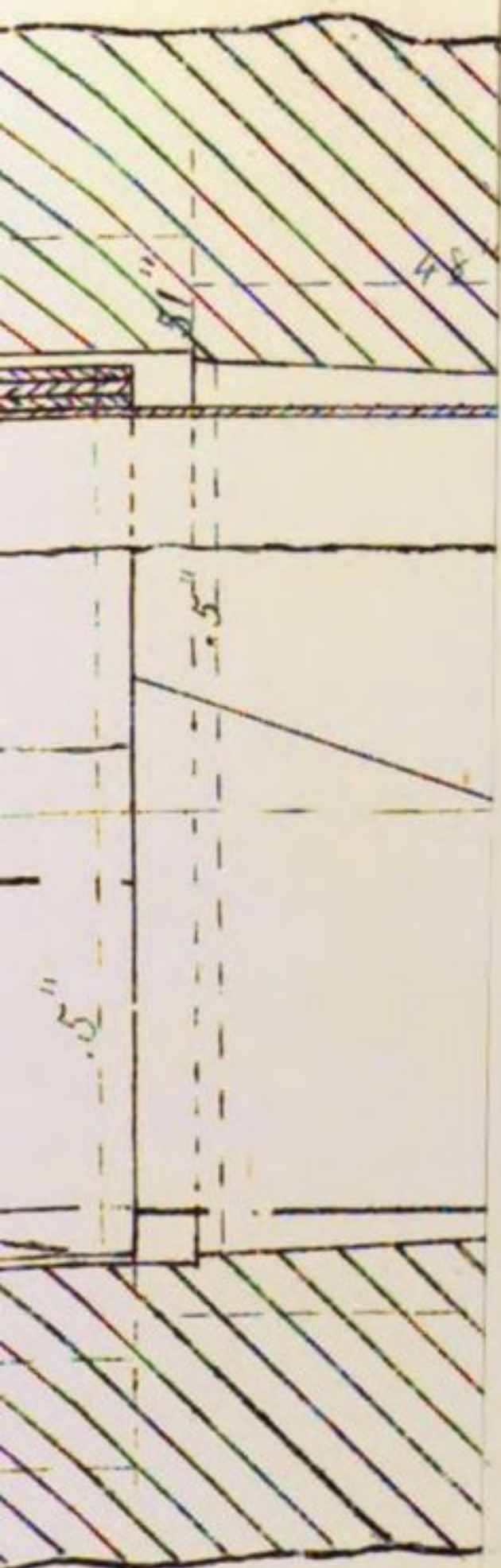


Fig 4. Gun Test
 cartridge No 58 in p.



Apparatus A - Focussing
 Small Gun Calibre 1/2
 W. H. Jones

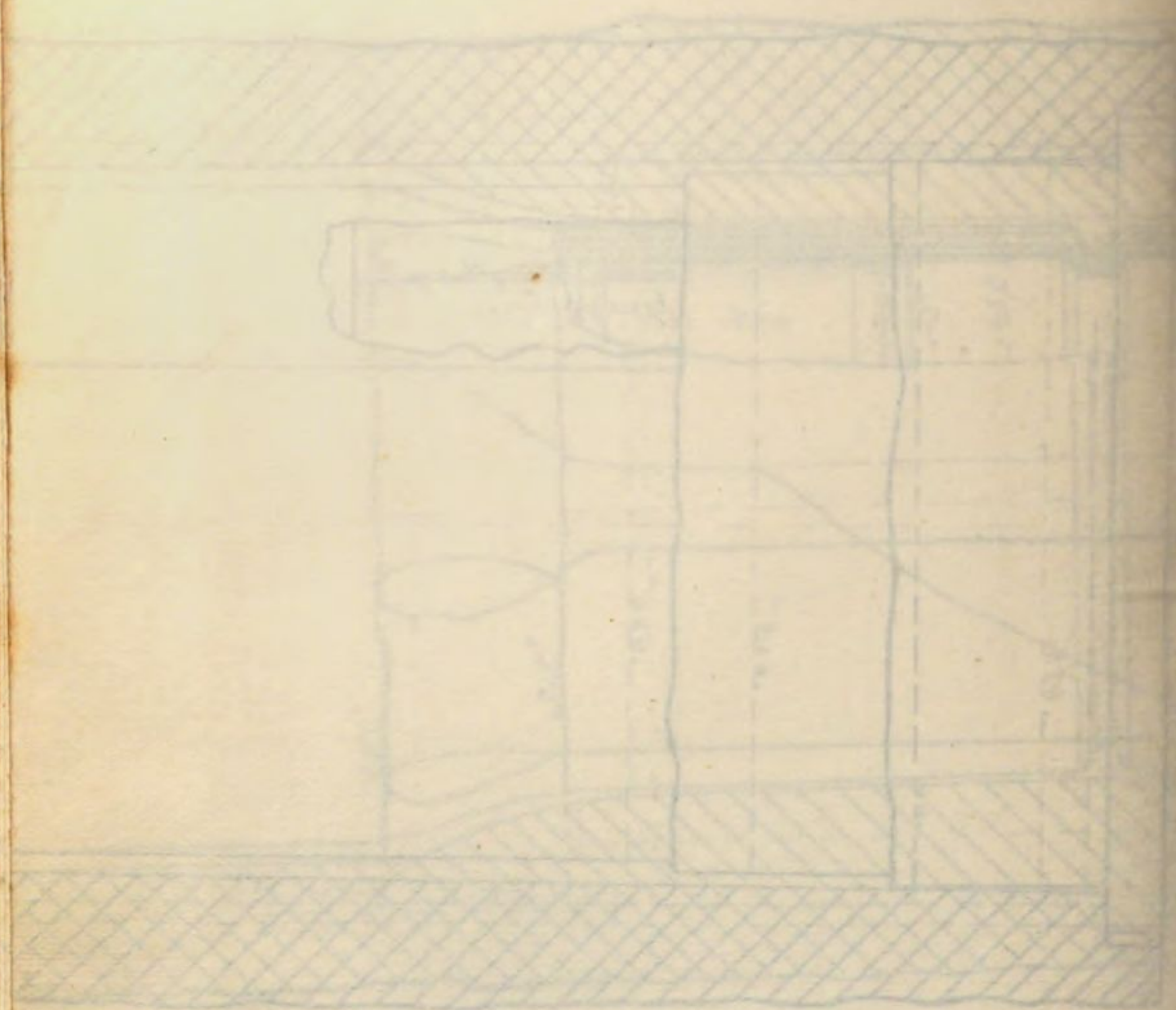


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 people. It is a very interesting and
 valuable work. The second part is a
 description of the climate and the
 soil. The third part is a description
 of the agriculture and the
 commerce. The fourth part is a
 description of the government and the
 laws. The fifth part is a description
 of the education and the
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 description of the arts and the
 sciences. The seventh part is a
 description of the history and the
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 description of the geography and the
 topography. The ninth part is a
 description of the natural history and the
 minerals. The tenth part is a
 description of the statistics and the
 population. The eleventh part is a
 description of the military and the
 naval forces. The twelfth part is a
 description of the public works and the
 infrastructure. The thirteenth part is a
 description of the social and the
 economic conditions. The fourteenth part
 is a description of the political and the
 administrative system. The fifteenth part
 is a description of the cultural and the
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 description of the religious and the
 moral life. The seventeenth part is a
 description of the scientific and the
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 is a description of the artistic and the
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I.—ORDNANCE MEMORANDA No. 16.

REPORT
OF
THE BOARD OF OFFICERS
CONVENED AT
NEW YORK CITY, JANUARY 16, 1873,
TO
EXAMINE AND REPORT UPON PLANS AND MODELS
OF SUCH
DEPRESSING AND OTHER CARRIAGES FOR HEAVY ORDNANCE
AS
THE BOARD SHOULD DEEM WORTHY OF TRIAL.

REPORT OF THE BOARD OF OFFICERS

NEW YORK CITY

REPORT OF THE BOARD OF OFFICERS

NEW YORK CITY

REPORT OF THE BOARD OF OFFICERS

REPORT OF THE BOARD OF OFFICERS

REPORT OF THE BOARD OF OFFICERS

NEW YORK CITY, *February* 18, 1873.

SIR: I have the honor to inclose the report of the Board convened by virtue of General Orders No. 106, Adjutant General's Office, December 13, 1872, to be laid before the honorable Secretary of War.

I am, sir, very respectfully, your obedient servant,

WM. H. FRENCH,
Lieutenant Colonel Second Artillery, Brevet Major General,
President of Board.

The CHIEF OF ORDNANCE,
Washington City.

NOTE.—The references to appended documents refer to the papers with the original report of the Board. These papers are not published herewith.

REPORT.

Proceedings of a Board convened by virtue of the following order :

[General Orders No. 106.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, December 13, 1872.

A Board, to consist of Lieutenant Colonel W. H. French, Second Artillery ; Lieutenant Colonel H. G. Wright, Corps of Engineers ; Major J. C. Tidball, Second Artillery ; Captain D. W. Flagler, Ordnance Department ; Captain S. N. Benjamin, Second Artillery, is appointed to meet in New York City on the 16th day of January, 1873, or as soon thereafter as practicable, to examine and report upon plans and models of such depressing and other carriages for heavy ordnance as the Board may deem worthy of trial.

The Chiefs of Engineers and Ordnance will lay before the Board all papers bearing upon the subject.

The report of the Board will be made to the Secretary of War through the Chief of Ordnance.

The junior member of the Board will act as recorder.

By order of the Secretary of War :

E. D. TOWNSEND,
Adjutant General.

Official :

WM. D. WHIPPLE,
Assistant Adjutant General.

NEW YORK CITY, *January 16, 1873.*

The Board met in the Army Building, New York City, on the day appointed, at 12.10 p. m. Present, all the members named in the order.

A communication from James B. Eads (appended, marked Communication No. 1) was laid before the Board by Lieutenant Colonel W. H. French, Second Artillery. The Board directed the recorder to inform Mr. James B. Eads that his model (or models) could be sent to "Board on Gun-Carriages," Army Building, New York City. (Appended, marked Reply No. 1.)

Two boxes containing models and one box containing papers and drawings were received from the Ordnance Office, also one box containing papers and drawings from the Chief of Engineers.

The Board resolved that its meetings should be held daily, Sundays excepted, convening at 10 o'clock a. m. After discussion in regard to the method and order in which the papers and designs before the Board should be examined and considered, the Board adjourned.

NEW YORK CITY, *January 17, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved. A communication from E. P. Irons, M. D., of Baltimore, Maryland, was received (forwarded by the Chief of Ordnance) and read. (Appended, marked Communication No. 2.)

The papers relating to, and drawings of, Mr. James B. Eads's steam gun-carriage (18 inclosures) were then examined by the Board.

The Board decided to defer further consideration on this subject until Mr. Eads should appear before the Board with his model.

The Board then read over and discussed the papers relating to Lieutenant Smoot's "depressing carriages for 20'' guns, to be operated by steam"—(1 letter and 1 drawing;) "system of operating heavy ordnance by steam-power"—(1 letter and 7 tracings;) "compression for absorbing recoil of 20'' gun"—(1 letter and 1 drawing,) and "compressor for absorbing recoil of 15'' gun"—(1 drawing.) All these papers and drawings received from Chief of Ordnance.

The Board decided to defer further deliberation on these carriages until after other plans had been examined and discussed.

The following resolution was adopted:

Resolved, That the Board take up all the plans submitted by the Chiefs of the Ordnance and Engineer Departments, and from all other sources, and examine them previously to the expression of opinion upon their merits.

The Board then examined successively the papers and plans relating to Wappich's carriage. (Several copies of printed circulars;)

Lieutenant J. A. Kress's (Ordnance Department) method of loading and maneuvering heavy guns—(1 letter, 4 tracings, and report of board;)

Lieutenant J. A. Kress's (Ordnance Department) traversing heavy sea-coast guns by steam-power—(1 letter and 1 tracing;) and

Lieutenant J. G. Butler's (Ordnance Department) counterpoise gun-carriage—(1 letter and 1 drawing.)

All the above papers and drawings were received from the Chief of Ordnance.

The Board then adjourned.

NEW YORK CITY, *January* 18, 1873.

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

The Board then examined the papers and drawings relating to Benton's apparatus for maneuvering heavy guns and tests of same.

Ordnance 15'' barbette carriage, front pintle, increased in height with two air-cylinders—(1 letter and 5 tracings;)

Ordnance 15'' barbette carriage, center pintle, altered for two air-cylinders—(4 letters and 2 tracings;)

A. T. Brewer's counterpoise platform for siege and garrison gun—(1 letter;)

Lieutenant G. K. Dakin's (Third Artillery) rotary gun-carriage—(1 letter and 1 tracing;)

Lieutenant Colonel T. T. S. Laidley's (Ordnance Department) depressing gun-carriage to be operated by gun-cotton—(2 letters;)

Mr. John Ridgway's (submitted by F. S. Williams) vertical revolving battery—(3 letters and 3 printed pamphlets;)

James T. Ryan's revolving iron fort and pneumatic carriage—(1 printed pamphlet and 5 drawings;) and

Lieutenant Colonel T. J. Rodman's (Ordnance Department) loading-house of 15'' gun—(2 drawings.)

Having finished examining these papers and plans, all of which were forwarded to the Board by the Chief of Ordnance, the Board adjourned until Monday, the 20th instant.

NEW YORK CITY, *January 20, 1873.*

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

The Board then examined the papers relating to, and a model of, a counterpoise gun-carriage, devised by Captain A. R. Buffington, Ordnance Department—(2 letters;)

A model of a depressing carriage, devised by Lieutenant A. L. Varney, Ordnance Department—(1 letter;) and

A model of a gun-carriage, devised by Mr. T. R. Timby, of Tarrytown, New York. As no paper accompanied this model, the Board directed the recorder to notify Mr. Timby that his model had been forwarded to the Board by the Chief of Ordnance, and that the Board was ready to receive whatever information he might wish to lay before it concerning the same. (Copy appended, marked No. 3.)

Letter from Mr. M. D. Lawrence to the Secretary of War, in regard to a depressing carriage, was then read. Also, a letter from Mr. James M. Albertson in regard to a device for raising and lowering guns within a parapet.

The papers relating to, and photographs and drawings of, Captain W. R. King's (Engineer Corps) depressing gun-carriage, (17 letters and 1 drawing;) Lieutenant J. G. Butler's (Ordnance Department) counterpoise carriage, (1 letter and 1 tracing;) Henry Caudwell's maneuvering heavy guns and loading apparatus, (7 letters and 4 tracings,) were read and examined. Also, a letter in regard to J. R. Kelso's gun-carriage. All the foregoing papers and drawings were received from the Ordnance Office.

The Board then adjourned.

NEW YORK CITY, *January 21, 1873.*

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

The following papers and drawings were read and examined: Letter in regard to, and a drawing of, a hydraulic buffer, used in England to check recoil, submitted by Colonel Barnard, Engineer Corps, to the Chief of Engineers, and referred by him to the Chief of Ordnance, who forwarded them to the Board; letter and printed pamphlet in regard to a device for checking recoil of gun-carriages, submitted by Captain J. Wall Wilson, United States Revenue Marine; a number of target records and reports, ten in all, of firing 15" and 10" Rodman guns to test the two air-cylinder device for checking recoil.

The Board, having now read and examined all the papers, drawings, and models forwarded by the Chief of Ordnance, proceeded to take up those forwarded by the Chief of Engineers, viz:

A printed volume on counterpoise gun-carriages and platforms, compiled by Captain W. R. King, Engineer Corps, and published by direction of the Chief of Engineers. (This volume was laid before the Board by Lieutenant Colonel H. G. Wright, Engineer Corps.)

The papers relating to, and drawings of, Captain W. R. King's depressing carriage. (For list of papers see schedule appended, marked No. 4.)

All the papers relating to, and drawings of, Lieutenant Colonel Foster's (United States Engineers) devices for depressing gun-carriages, and a cyclophoretic gun-carriage. (For list of papers see schedule appended, marked No. 4.)

Having read and examined these papers and drawings, the Board adjourned.

NEW YORK CITY, *January 22, 1873.*

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

The papers relating to Colonel J. G. Barnard's (Engineer Corps) design for depressing gun-carriage (1 letter and 1 drawing) were read and examined.

Mr. T. R. Timby appeared before the Board and explained his device for lessening the effect of the shock of discharge on the pintle and chassis.

The Board then examined the papers and drawings relating to Major D. C. Houston's (Corps of Engineers) project for an earthen battery and truck to give protection to guns and gunners. (For list of papers and drawings see schedule appended, marked No. 4.)

The drawings of Colonel Serrell's design for iron fort and depressing gun-carriage—(3 sheets drawing.)

The papers and drawings of Captain W. R. King's (Engineer Corps) muzzle-pivoting gun-sling for casemate-guns, and the drawings of Captain W. R. King's (Engineer Corps) casemate-carriage for 10'' Rodman gun without tongue. (For list of papers see schedule appended, marked 4.)

Papers relating to, and drawings of, casemate-carriage without tongue, by Major D. C. Houston, Engineer Corps—(1 sheet drawings and proceedings of Board.)

Design for altering chassis of 10'' casemate-carriages, to dispense with tongue, by Major Q. A. Gillmore, Engineer Corps—(1 sheet drawings.)

Papers relating to, and drawings of, apparatus for checking recoil of 15'' guns, by Colonel Henry Brewerton, Corps of Engineers—(1 sheet drawings and report of Board of Engineers.)

Photographs of Wappich's casemate carriage for muzzle-pivoting, (2 photographs,) and the papers and drawings relating to Captain W. R. King's (Engineer Corps) project of mortar-beds for 13'' and 15'' mortars. (Report by Major H. L. Abbot, United States Engineers, report of Board of Engineers for fortifications, with 1 sheet drawings.)

The Board directed the recorder to notify Mr. James B. Eads, by telegraph, that they were waiting the arrival of the model of his depressing gun-carriage. Also, to notify Captain J. Wall Wilson that his model, showing device for checking recoil, would be inspected on Friday, the 24th instant. (Letter and telegram appended, marked, respectively, No. 5 and No. 6.)

A letter from Mr. A. T. Brewer, stating that he wished to lay before the Board models of a counterpoise platform and of a telescopic rammer, was received and read. (Letter appended, marked No. 7.)

The recorder was directed to inform Mr. Brewer that the Board was ready to receive his models. (Answer appended, marked No. 8.)

The Board then adjourned.

NEW YORK CITY, *January 23, 1873.*

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

The following reports, received from the Chief of Engineers, were examined:

Report showing result of experiments to test front-pintle platform for 10'' and 15'' Rodman guns, October 17, 1867;

Report as to experiments upon the center pintle 15" gun platform, New Battery, Fort Hamilton, May 29, 1868;

Report of Brevet Brigadier General Brewerton of firing with 10" and 15" guns from barbette platforms at Fort Monroe, August 21, 1868;

Report of Brevet Major Generals Newton and Gillmore, United States Engineers, on experimental tests of the 5" pintles in 15" gun platforms at New Battery, Fort Hamilton, September 30, 1869;

Report of Brevet Major Generals Newton and Gillmore, United States Engineers, of firing to test platforms, May 4, 1869; and

Report of experiments with certain gun platforms at Fort Monroe, Virginia, June 1, 1871.

These were examined with a view of learning the effects of the shocks and strains of the firing on the carriages.

The Board, having read over and examined all the papers received from the Chief of Ordnance and Chief of Engineers, and from all other sources, proceeded to again take up and consider the various projects brought to its notice thereby, in order to determine those they should deem worthy of trial.

A letter was written and sent to the Chief of Ordnance, requesting him to forward to the Board reports, if any, of tests of King's elevating apparatus and other devices. (Copy appended, marked No. 9.)

The Board decided to defer for further consideration "depressing carriage for 20" gun to be operated by steam," and "system of operating heavy ordnance," both by Lieutenant W. S. Smoot, Ordnance Department.

The Board again took up and discussed the following projects and papers:

Lieutenant W. S. Smoot's (Ordnance Department) device for absorbing recoil of 20" gun by compression.

M. Wappich's casemate gun-carriage, muzzle-pivoting.

Lieutenant J. A. Kress's (Ordnance Department) method of loading and maneuvering heavy guns by steam.

Lieutenant J. G. Butler's (Ordnance Department) counterpoise gun-carriage.

Major J. G. Benton's (Ordnance Department) apparatus for maneuvering heavy guns. Deferred for further consideration.

Major T. G. Baylor's (Ordnance Department) report on ordnance 15" barbette carriages, front pintle, increased in height with two air-cylinders. Deferred for further consideration.

Major T. G. Baylor's (Ordnance Department) report on ordnance 15" barbette carriages, center pintle, two air-cylinders. Deferred for further consideration.

A. T. Brewer's counterpoise platform for siege and garrison guns. Deferred for further consideration.

Lieutenant G. K. Dakin's (Third Artillery) rotary gun-carriage.

James B. Eads's steam gun-carriage. Deferred for further consideration.

John Ridgway's vertical revolving battery.

Lieutenant Colonel T. T. S. Laidley's (Ordnance Department) depressing carriage to be operated by gun-cotton.

James T. Ryan's revolving iron fort, with pneumatic carriage.

Lieutenant Colonel T. J. Rodman's (Ordnance Department) loading-house for heavy guns.

Captain A. R. Buffington's (Ordnance Department) counterpoise gun-carriage. Deferred for further consideration.

Lieutenant A. L. Varney's (Ordnance Department) counterpoise gun-carriage.

M. D. Lawrence's depressing gun-carriage. The Board directed the recorder to notify Mr. Lawrence that it was ready to receive his plans. (Copy appended, marked No. 10.)

J. M. Albertson's depressing gun-carriage.

Captain W. R. King's (Engineer Corps) depressing gun-carriage. Deferred for further consideration.

Lieutenant J. G. Butler's* (Ordnance Department) counterpoise gun-carriage. Deferred for further consideration.

Henry Caudwell's apparatus for maneuvering and loading heavy guns.

J. R. Kelso's gun-carriage.

Hydraulic buffers used in England to check recoil. Referred by General A. A. Humphreys, Chief of Engineers, to Chief of Ordnance.

Captain J. Wall Wilson's (United States Revenue Marine) device for checking recoil on gun-carriages. Deferred for further consideration.

The letters and reports on the tests of 15'' and 10'' carriages with two air-cylinders were deferred to be considered with the carriages to which they relate.

The Board then adjourned.

NEW YORK CITY, *January 24, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

The Board directed the recorder to notify Captain J. Wall Wilson that they would defer the examination of his model until the 27th instant. (Copy appended, marked No. 11.)

The Board then proceeded to again examine the papers and drawings appertaining to the following plans and projects, viz:

Depressing gun-carriages, devised by Lieutenant Colonel Foster United States Corps of Engineers—(13 projects.)

A cyclophoretic carriage, designed by Lieutenant Colonel Foster, Engineer Corps.

Colonel J. G. Barnard's (Engineer Corps) depressing gun-carriage.

Captain W. R. King's (Engineer Corps) depressing gun-carriage. Deferred for further consideration.

Major D. C. Houston's (Engineer Corps) project for earthen battery to give protection to guns and gunners, with truck for gun.

Colonel Serrell's design for iron fort and depressing gun-carriage.

Captain W. R. King's (Engineer Corps) counterpoise muzzle-pivoting gun-sling for casemate-gun. Deferred for further consideration.

Captain W. R. King's (Engineer Corps) casemate-carriage for 10'' Rodman gun, without tongue.

Major D. C. Houston's (Engineer Corps) casemate-carriage, without tongue.

Major Q. A. Gillmore's (Engineer Corps) design for altering the chassis of casemate-carriages for 10'' gun to dispense with tongue.

Colonel Brewerton's apparatus for checking recoil of 15'' gun.

M. Wappich's casemate gun-carriage, muzzle-pivoting.

* Ordnance Office file 5908, dated December 10, 1872.

Captain W. R. King's (Engineer Corps) project for mortar-beds for heavy mortars. Deferred for further consideration.

After consideration of, and discussion on, these projects, the Board adjourned until Monday, January 27.

NEW YORK CITY, *January 27, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

A telegram from Mr. James B. Eads was received, stating that he would forward his model and that he could appear before the Board in two or three weeks.

A communication from the Bureau of Steam Engineering, Navy Department, was received, stating that Mr. Eads's model was expressed on the 25th instant. (Both appended, marked, respectively, No. 12 and No. 13.)

The Board then examined the papers and drawings relating to "Nuttall's" depressing gun-carriage, (2 photographs, 1 sheet of drawings, and 1 letter,) submitted by Mr. M. D. Lawrence, who requested that they should be returned to him after examination.

The Board then went to No. 30 Broadway, and examined a model of Captain J. Wall Wilson's device for checking recoil.

Captain Wilson, being present, explained its action.

The Board then adjourned.

NEW YORK CITY, *January 28, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

A communication (appended, marked No. 14) from the Chief of Ordnance was received, transmitting Major T. G. Baylor's (Ordnance Department) report on the trials of "King's elevating apparatus," Butler's lever and clutch, and the ordinary elevating apparatus. (Letter and 2 inclosures.) These were read and discussed.

The model of Mr. James B. Eads's pneumatic depressing carriage was received from the Navy Department, Washington, District of Columbia. This model is the one referred to in the correspondence between Mr. James B. Eads and the Board. All of the papers relating to Mr. Eads's devices were now taken up and discussed.

The recorder was directed to telegraph Mr. Eads to send his other model, with full explanations, or to appear before the Board in person as soon as possible. (Copy of telegram appended, marked No. 15.)

After further deliberation and discussion on the various projects before it, the Board adjourned.

NEW YORK CITY, *January 29, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

Mr. A. T. Brewer appeared before the Board with a telescopic rammer and a model of a counterpoise platform; these were worked and fully

explained by him. He also submitted drawings of these devices. (Two sheets of each device, marked A. T. Brewer.)

A letter from Major J. G. Benton, Ordnance Department, addressed to the Chief of Ordnance, and forwarded by him to the Board, was received and read. (Copy appended, marked No. 16.) The letter stated that Major Benton's apparatus for maneuvering and loading heavy guns under cover had been applied to an 8" gun at Springfield Armory, and would soon be ready for trial.

The following resolution was then offered by Captain D. W. Flagler, and carried unanimously:

Resolved, That, for a better understanding of the subjects before the Board, the Chief of Ordnance be requested to obtain orders for the Board to visit Fort Monroe, Virginia, and Springfield Armory, Massachusetts, for the purpose of examining various gun-carriages and apparatus for maneuvering the same, and to witness the action of the carriages in actual use.

A letter was written to the Chief of Ordnance, notifying him of the above resolution and its adoption. (Copy appended, marked No. 17.)

Mr. Brewer appeared a second time before the Board, and gave some further information in regard to his device. He requested and received permission to take away with him his model and rammer..

The Board then adjourned.

NEW YORK CITY, *January 30, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

The Board again took up and discussed Lieutenant W. S. Smoot's depressing carriage for 20" gun to be operated by steam; also, Lieutenant Smoot's system of operating heavy ordnance by steam-power.

Captain A. R. Buffington's counterpoise carriage was re-examined and discussed at length, and the following resolution was offered and carried unanimously:

Resolved, That the Board is of the opinion that the principles involved in the carriage proposed by Captain A. R. Buffington, Ordnance Department, are very valuable, and worthy of trial; that the Board regrets that no detailed drawings were furnished which would enable the Board to judge of the practicability of constructing a carriage with such mechanism and strength as would be required in the actual service of a carriage; but the Board recommends that Captain Buffington be invited to furnish to the Chief of Ordnance detailed working drawings, with estimates of strength of parts and cost, and that if such drawings and estimates are satisfactory, that the carriage be constructed and tested.

The plan for a counterpoise carriage, submitted by Lieutenant J. G. Butler (Ordnance Department) to the Chief of Ordnance, December 10, 1872, was again examined and discussed; also a project for mortar-beds for heavy mortars, by Captain W. R. King, Engineer Corps.

The Board then adjourned.

NEW YORK CITY, *January 31, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

The Board again took up the subject of the counterpoise muzzle-pivoting gun-sling, devised by Captain W. R. King, Engineer Corps, for casemate-guns.

The following resolution was offered by Lieutenant Colonel H. G. Wright:

Resolved, That this Board recommends the construction and trial of the counterpoise muzzle-pivoting gun-sling for casemate-guns, designed by Captain W. R. King, and submitted by him to the Chief of Engineers, with letter of September 11, 1869.

Captain D. W. Flagler offered the following amendments to the above resolution, viz:

1. *Provided*, That the gun-sling be constructed for a 15" gun, as recommended by Chief of Engineers October 8, and Chief of Ordnance November 1, 1869.

2. *Provided further*, That the effect upon the gun-sling of shot fired against the walls of the casemate in which it is put up be a part of the test of the gun-sling.

After deliberation the vote on the second amendment was taken, and the same lost:

YEA—Captain D. W. Flagler.

NAYS—Lieutenant Colonel French, Lieutenant Colonel Wright, Major Tidball, and Captain Benjamin.

The vote on the first amendment was taken, and the same lost:

YEA—Captain Flagler.

NAYS—Lieutenant Colonel French, Lieutenant Colonel Wright, Major Tidball, and Captain Benjamin.

The vote on the resolution was then taken, and it was carried unanimously.

King's depressing gun-carriage and King's proposed mortar-beds were again discussed.

After further discussion on the matters before it, the Board adjourned.

NEW YORK CITY, *February 1, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the previous day were read and approved.

The Board decided that a letter should be written to the Chief of Ordnance, requesting him to authorize the photographing of the different models before it, at the expense of the Ordnance Department. (Copy appended, marked No. 18.)

The Board then adjourned to meet at Springfield Armory, Massachusetts, on Monday, February 3.

SPRINGFIELD, MASSACHUSETTS, *February 3, 1873.*

The Board met pursuant to adjournment, (present all the members,) and proceeded to inspect Colonel J. G. Benton's (Ordnance Department) loading and maneuvering apparatus. This was attached to an 8" Rodman gun mounted on a barbette carriage, front pintle. (No eccentric on chassis.) The gun was elevated, depressed, run from and into battery, traversed to the right and left, and loaded under cover with shot, both with and without sabot, several times, under the direction of Colonel

Benton, who also exhibited to the Board a working model and drawings of his apparatus.

The Board then adjourned to meet at Fort Monroe, Virginia, on Thursday, the 6th instant.

FORT MONROE, VIRGINIA, *February 7, 1873.*

The Board met at 10 o'clock a. m., having been delayed one day by the Norfolk boat leaving before the arrival of the train at Baltimore, Maryland; all the members being present. It being too stormy to witness the working of the carriages, the Board adjourned to meet on the 8th instant at 10 a. m.

FORT MONROE, VIRGINIA, *February 8, 1873—10 a. m.*

The Board met pursuant to adjournment. Present, all the members.

The Board inspected Wappich's carriage, the "service" carriage with two air-cylinders attached, the "service" carriage increased in height and air-cylinders attached, and the 13" mortar and bed mounted on a chassis.

The 15" gun on the service carriage increased in height was loaded under cover and maneuvered in every manner. The gun was fired three times with full-service charge.

The 13" mortar and bed was also maneuvered and fired once; the maneuvering was made under the direction of Major Baylor, of the United States Ordnance.

The Board then adjourned to meet in New York City on the 11th instant.

NEW YORK CITY, *February 11, 1873.*

The Board met pursuant to adjournment. Present, all the members.

The proceedings of the 1st, 3d, 7th, and 8th instants were read and approved.

A letter and telegram were received from Mr. James B. Eads, referring to the shipment of his model and his appearing before the Board. (Appended, marked No. 19.) These arrived during the absence of the Board.

Mr. James B. Eads's model having arrived from Saint Louis, Missouri, and Mr. Eads having explained its working and parts to a member of the Board on the 10th instant, his devices for a pneumatic depressing carriage were discussed.

A letter from the Chief of Ordnance was received, notifying the Board that Major Silas Crispin, United States Ordnance Department, had been instructed to have photographs made of such models and drawings as the Board might designate. (Letter appended, marked No. 20.)

The Board decided to apply, by telegram and letter, for authority to fire the gun on King's depressing carriage, at Fort Wadsworth, New York Harbor. (Letter appended, marked No. 21.)

A set of drawings and description of Benton's loading and maneuvering apparatus were received from Major J. G. Benton, and read and examined.

The following resolution was offered by Captain D. W. Flagler, and carried unanimously:

Resolved, That the Board recommend that the apparatus for maneuvering heavy guns, devised by Major J. G. Benton, Ordnance Department, and described in drawings and communication sent to the Board in his letter, dated February 7, 1873, be applied to, and tested on the 20" gun-carriage, and that the apparatus be worked by a steam-engine placed under cover near to, or, if practicable, in a niche within the parapet, and that the apparatus be so attached to the engine that it can be readily detached from the same and worked by hand.

The following resolution was offered by a member, and carried unanimously:

Resolved, That the Board deems the device for checking the recoil of heavy guns, presented by Captain J. Wall Wilson, United States Revenue Marine, worthy of trial, and do, therefore, recommend that it be applied to a 15" gun-carriage and chassis, and tested, unless the Navy Department has determined to test the same device with a gun of similar caliber.

The Board then adjourned.

NEW YORK CITY, *February 12, 1873.*

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

A gun mounted on a model of Mr. James B. Eads's pneumatic depressing carriage was fired several times, and the device discussed.

Judge Charles Mason appeared before the Board and presented and explained Mr. Atkins's device for loading heavy guns without a rammer by means of pneumatic pressure. A letter was written to Major S. Crispin, United States Ordnance, requesting him to have photographed certain models and drawings. *(Copy appended, marked No. 22.)

The Board then adjourned.

NEW YORK CITY, *February 13, 1873.*

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

There being no business before it, the Board adjourned, awaiting reply from the Chief of Ordnance to its application for authority to fire the gun mounted on King's depressing carriage at Fort Wadsworth, Staten Island.

NEW YORK CITY, *February 14, 1873.*

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

The following resolution was presented by Lieutenant Colonel French, and carried unanimously:

Resolved, That the non-depressing carriage increased in height and modified by the improved methods for working, with the addition of two air-cylinders for the purpose of absorbing the recoil, and also affording additional protection under the parapet to the men who serve the gun, recommends itself to the Board as the best service carriage for any locality and under any probable circumstances, until a depressing carriage,

whether by counterpoise, compressed air, steam, or any other methods, be decided upon as the standard for service, combining the advantages of economy, strength, simplicity in structure and handling, which characterize the improved non-depressing carriage.

The following resolution was offered by Major Tidball, and carried unanimously :

Resolved, That the Board considers the plan for constructing mortar-carriages and maneuvering the same, proposed by Captain W. R. King, (United States Engineers,) an improvement upon the old style of mortar-beds, but, having witnessed at Fortress Monroe the satisfactory working of a center-pintle chassis mortar-carriage, constructed by the Ordnance Department, the Board does not consider any trial of Captain King's device necessary.

The Board then adjourned, awaiting authority to fire the gun mounted on King's depressing carriage.

NEW YORK CITY, *February* 15, 1873.

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

A telegram and letter were received from the War Department, authorizing the firing of the 15'' gun mounted on King's depressing carriage. (Appended, marked No. 23.)

The Board telegraphed Captain W. R. King, United States Engineers, that they would inspect his gun-carriage at Fort Wadsworth on Monday, if the weather should be favorable. A letter was written to the commanding officer of Fort Wadsworth, New York Harbor, (appended, marked No. 24,) informing him of the proposed visit of the Board, and requesting him to provide the means for maneuvering and firing the gun mounted on King's depressing carriage.

The Board then adjourned until the 17th instant.

NEW YORK CITY, *February* 17, 1873.

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

The Board then proceeded to Fort Wadsworth, New York Harbor, and witnessed the firing of the 15'' gun mounted on King's depressing carriage. Full-service charges with solid shot were used. Four shots were fired at different elevations.

Captain King, United States Engineers, arrived just before the second shot was fired. The gun-detachment, though not familiar with the mechanism of the carriage, nor the method of loading a gun mounted upon it, seemed to find but little difficulty in maneuvering or loading.

The Board then adjourned.

NEW YORK CITY, *February* 18, 1873.

The Board met pursuant to adjournment. Present, all the members. The proceedings of the previous day were read and approved.

The following resolution was offered and carried unanimously :

Resolved, That the Board, being of the opinion that the depressing carriage devised by Captain W. R. King, United States Engineers, has already been sufficiently tested, and has been proved to be a good and reliable carriage for heavy guns, well adapted to certain localities, does therefore recommend that this carriage be subjected to such further trials as may be deemed necessary to determine its merits as compared with those of other carriages for heavy guns.

The Board have carefully examined and considered the plans, drawings, models, and papers submitted to it bearing upon the following devices, viz :

1	Depressing carriage for 20" gun, to be operated by steam.	Lieut. W. S. Smoot, Ordnance Department.
2	System of operating heavy ordnance by steam-power.	Do.
3	Compression for absorbing recoil of 20" gun.	Do.
4	Compressor for absorbing recoil of 15" gun.	Do.
5	Gun-carriage, muzzle-pivoting.	Mr. Wappich.
6	Method of loading and maneuvering heavy guns.	Lieut. J. A. Kress, Ordnance Department.
7	Traversing heavy sea-coast guns by steam-power.	Do.
8	Counterpoise gun-carriage.	Lieut. J. G. Butler, Ordnance Department.
9	Counterpoise gun-carriage.	Do.
10	Apparatus for maneuvering heavy guns.	Maj. J. G. Benton, Ordnance Department.
11	Service 15" barbette carriage increased in height with two air-cylinders, front pintle.	Ordnance Department.
12	Service 15" barbette carriage, center pintle altered for two air-cylinders.	Do.
13	Counterpoise platform for heavy guns.	A. T. Brewer.
14	Telescopic rammer.	Do.
15	Rotary gun-carriage.	Lieut. G. K. Dakin, Third Artillery.
16	Steam gun-carriage.	James B. Eads.
17	Pneumatic depressing carriage, (2 models).	Do.
18	Depressing gun-carriage, to be operated by gun-cotton.	Lieut. Col. T. T. S. Laidley, Ordnance Department.
19	Vertical revolving battery.	John Ridgway.
20	Revolving iron fort and pneumatic carriage.	James T. Ryan.
21	Loading-house for 15" gun.	Lieut. Col. T. J. Rodman, Ordnance Department.
22	Counterpoise gun-carriage.	Capt. A. R. Buffington, Ordnance Dep't.
23	Counterpoise gun-carriage.	Lieut. A. L. Varney, Ordnance Dep't.
24	Depressing gun-carriage.	(Nuttall's,) submitted by M. D. Lawrence.
25	Depressing gun-carriage.	Mr. Albertson.
26	Depressing gun-carriage.	Capt. W. R. King, Engineer Corps.
27	15" barbette carriage, front pintle and center pintle.	Ordnance Department.
28	Apparatus for maneuvering and loading heavy guns.	Henry Caudwell.
29	Kelso gun-carriage.	J. R. Kelso.
30	Hydraulic buffers used in England for checking recoil.	Letter referred by Gen. A. A. Humphreys, Chief of Eng'rs, to Chief of Ordnance.
31	Device for checking recoil of heavy guns.	Capt. J. Wall Wilson, U. S. A. M.
32	Device for lessening shock of discharge.	Mr. Timby.
33	Depressing gun-carriage.	Col. J. G. Barnard, Engineer Corps.
34	King's volume on counterpoise gun-carriages, published by Engineer Corps.	
35	Earthen battery and truck.	Major D. C. Houston, Engineer Corps.
36	Iron fort with depressing carriage.	Col. Serrell.
37	Counterpoise muzzle-pivoting gun-sling.	Capt. W. R. King, Engineer Corps.
38	Casemate-carriage, without tongue, for 10" Rodman gun.	Do.
39	Casemate-carriage, without tongue.	Major D. C. Houston, Engineer Corps.
40	Casemate-carriage, without tongue, 10" .	Major Q. A. Gillmore, Engineer Corps.
41	Apparatus for checking recoil.	Col. Henry Brewerton, Engineer Corps.
42	Mortar-bed for heavy mortars.	Capt. W. R. King, Engineer Corps.
43-55	Thirteen projects for depressing gun-carriages for 15" gun.	Lieut. Col. J. G. Foster, Engineer Corps.
56	Cyclophoretic gun-carriage.	Do.
57	Depressing carriage.	Major C. B. Reese, Engineer Corps.
58	Atkins's apparatus for loading without a rammer. (Wappich's carriage and Captain W. R. King's carriage. The papers in these two cases were received from both Departments—Engineer and Ordnance.)	(Atkins,) per Judge C. Mason.

From the foregoing the Board has decided to recommend for trial, in accordance with the resolutions contained in the body of the proceedings, the following projects, viz:

Benton's apparatus for maneuvering heavy guns; Major J. G. Benton, United States Ordnance.

Service 15" barbette carriage increased in height with two air-cylinders; Ordnance Department.

Counterpoise gun-carriage; devised by Captain A. R. Buffington, United States Ordnance.

Device for checking recoil of heavy guns; by Captain J. Wall Wilson United States Revenue Marine.

Counterpoise muzzle-pivoting gun-sling; devised by Captain W. R. King, United States Engineers.

Depressing carriage; devised by Captain W. R. King, United States Engineers.

The Board desires to avoid condemning the principle of steam and compressed air as a means of operating and maneuvering depressing and other carriages, for, in the opinion of the Board, these means offer such advantages as to warrant the recommendation that the principle should be fully examined and tested, but none of the plans or models, possessing this principle presented seem to have been sufficiently developed to warrant the Board in recommending them for construction.

The Board, in including its labor of investigating the qualities of the models and plans for heavy gun-carriages, propose no one in particular as a standard to the exclusion of all others, leaving the selection in each case to be determined by economy, locality, and the circumstances of general advantage.

The Board, having no further business before it, then adjourned *sine die*.

WM. H. FRENCH,

Lieut. Col. Second Artillery, Br't Maj. Gen.

H. G. WRIGHT,

Lieut. Col. of Eng's, Br't Maj. Gen.

JOHN C. TIDBALL,

Maj. Second Artillery, Br't Brig. Gen.

D. W. FLAGLER,

Capt. of Ordnance, Br't Lt. Col.

S. N. BENJAMIN,

Captain Second Artillery.

[Indorsements.]

ORDNANCE OFFICE, May 19, 1873.

Respectfully submitted to the Secretary of War with the following recommendations:

1. That the carriages provided with air-cylinders (pneumatic buffers) be adopted for the military service.

2. That the center-pintle chassis for mortar-carriages, as constructed by the Ordnance Department, be also adopted.

3. That Benton's apparatus for maneuvering heavy guns be tested.

4. That the other systems of carriages recommended by the Board be experimented with whenever funds are available for the purpose.

A. B. DYER,

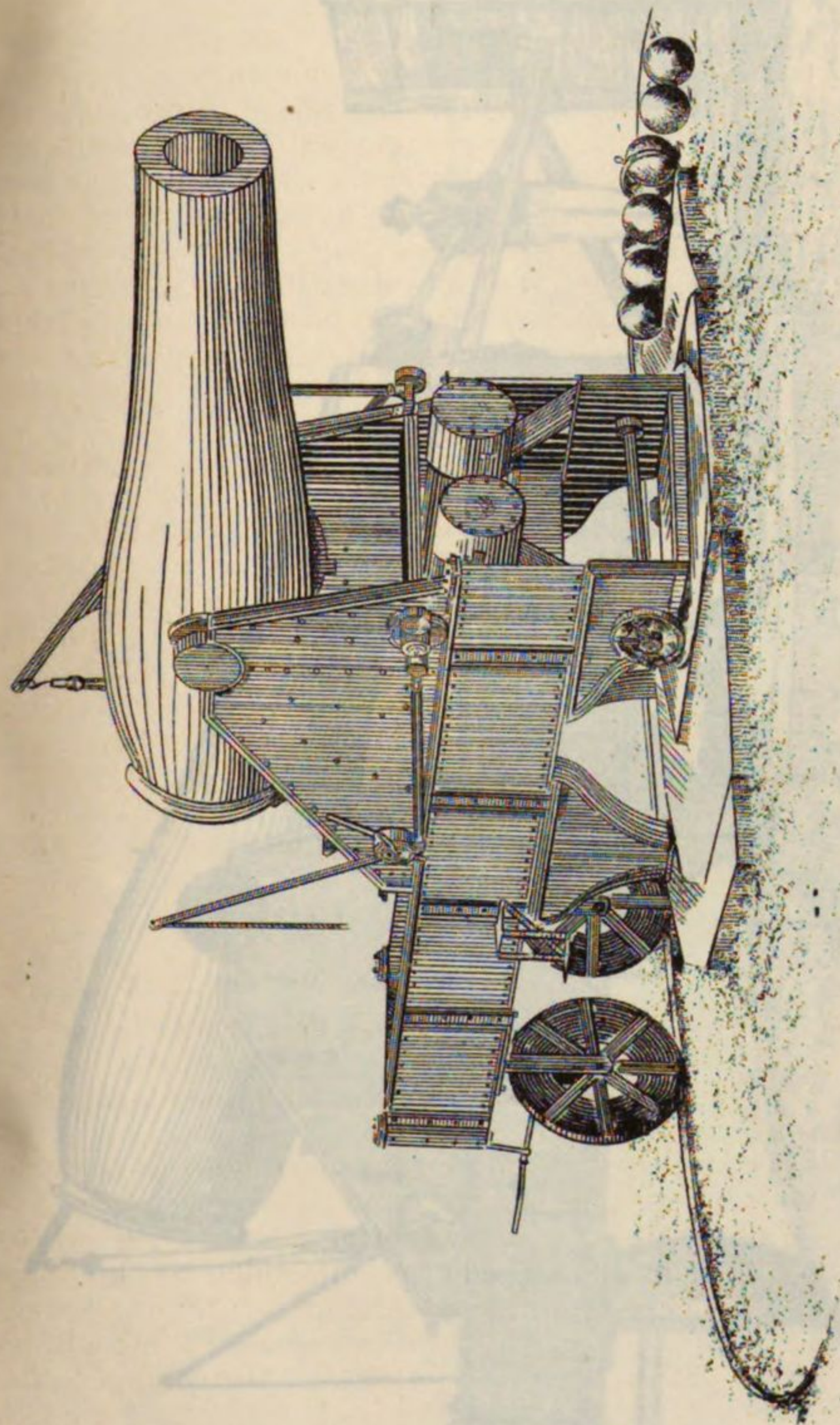
Chief of Ordnance, U. S. A.

Approved.

WM. W. BELKNAP,

Secretary of War.

MAY 20, 1873.



SERVICE 15 INCH BARBETTE CARRIAGE
increased in height with two air cylinders.

REPORT OF THE SECRETARY OF WAR.

...increased in height with two air-cylinders
...by Captain A. B. Huntington
...by Captain J. Wall Waller
...by Captain W. B. King, United States

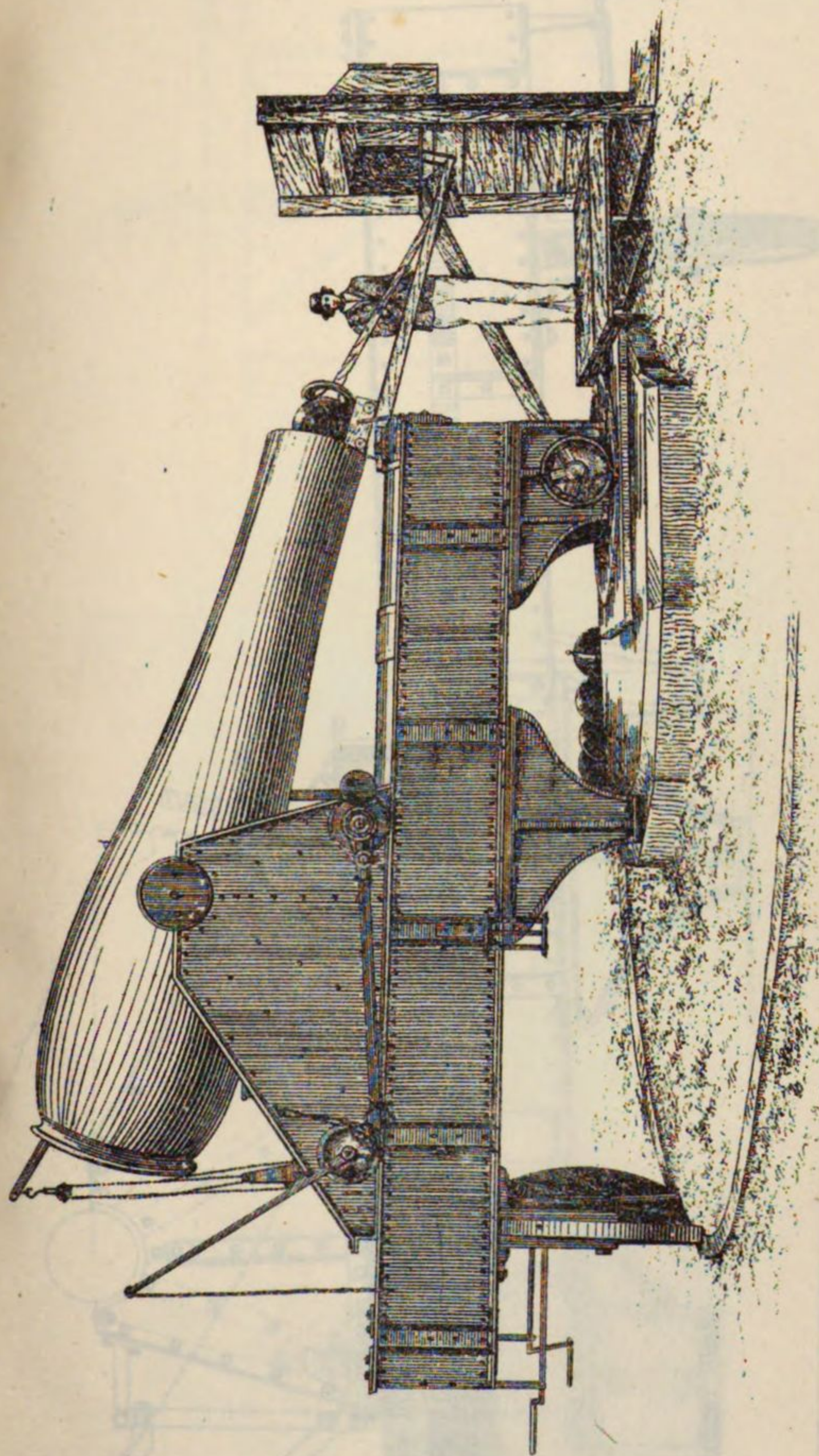
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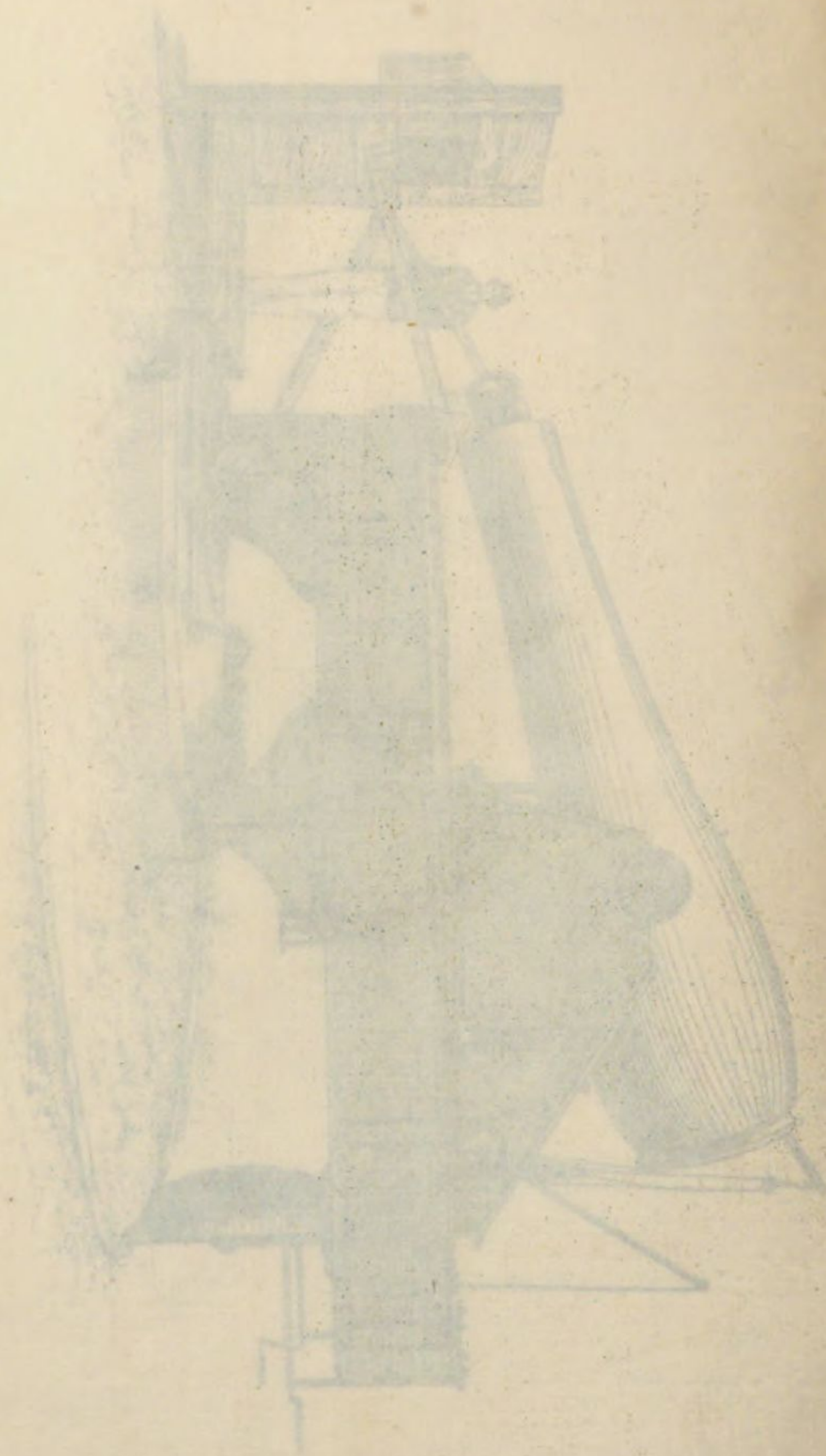
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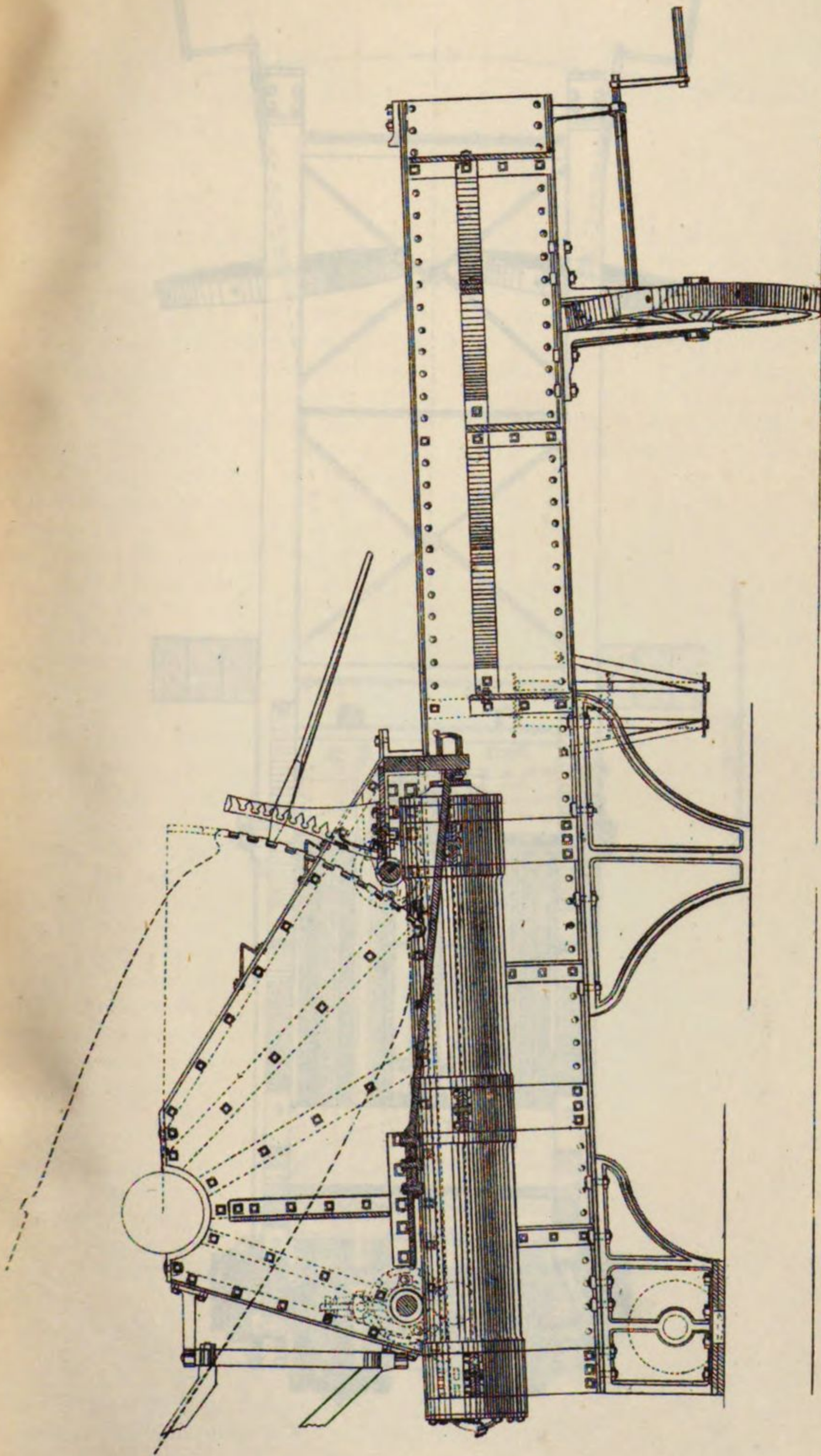


SERVICE 15 INCH BARBETTE CARRIAGE
increased in height with two air cylinders

ИЗДАНИЕ ВЪ ПЕРВОМЪ ВЫПУСКѢ

СЕРІА 12 ИЗЪ ВЫПУСКОВЪ СЪВѢЩАТЕЛЬНЫХЪ



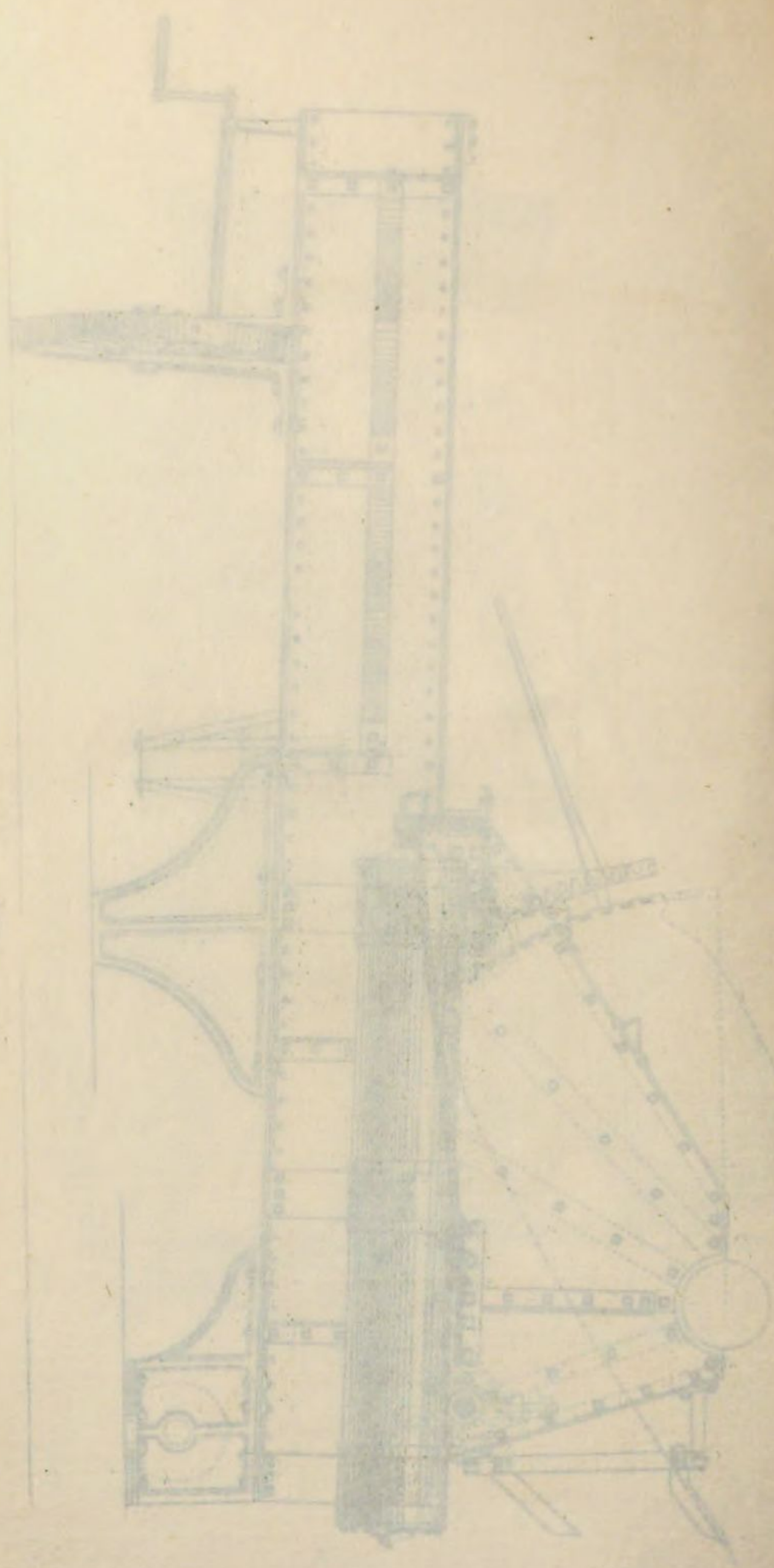


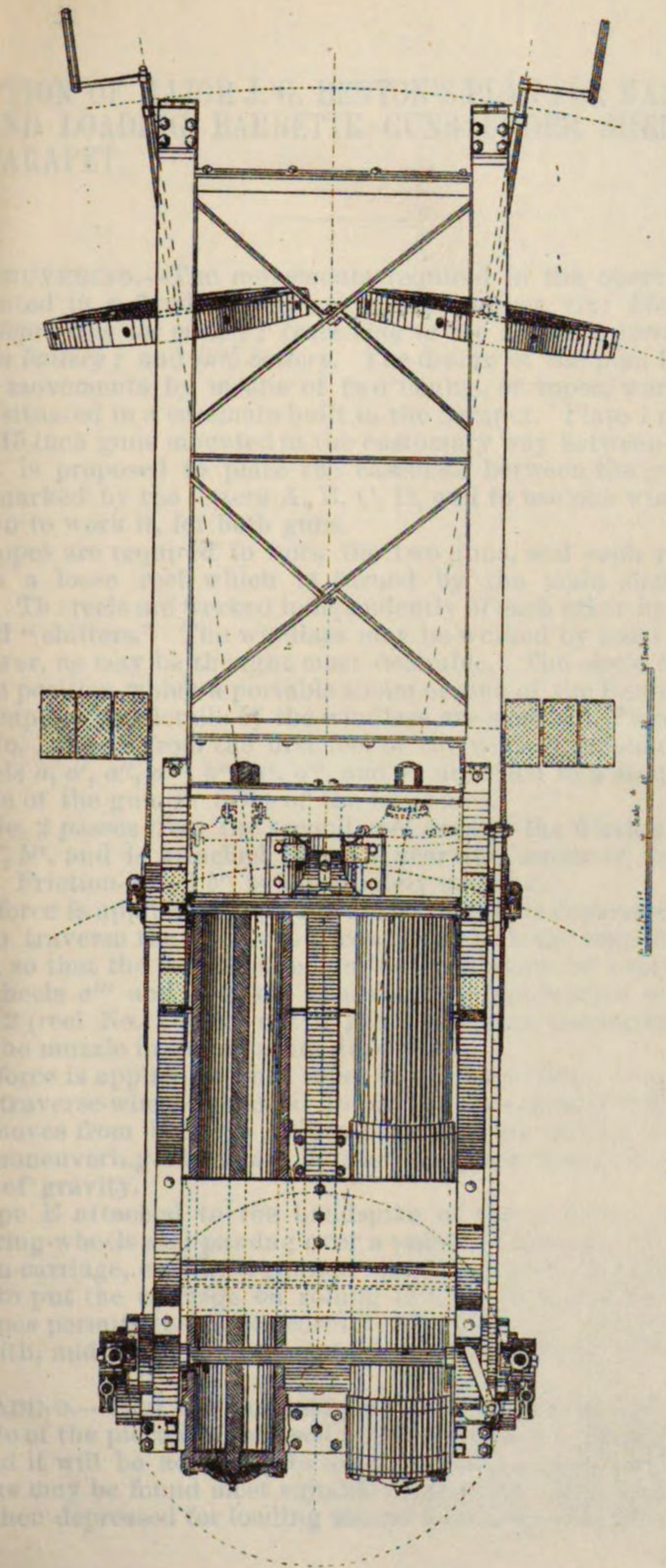
SERVICE 15 INCH. BARRETTE CARRIAGE

increased in height with two air cylinders.

SECTION OF THE RIVER LAR CHURCH

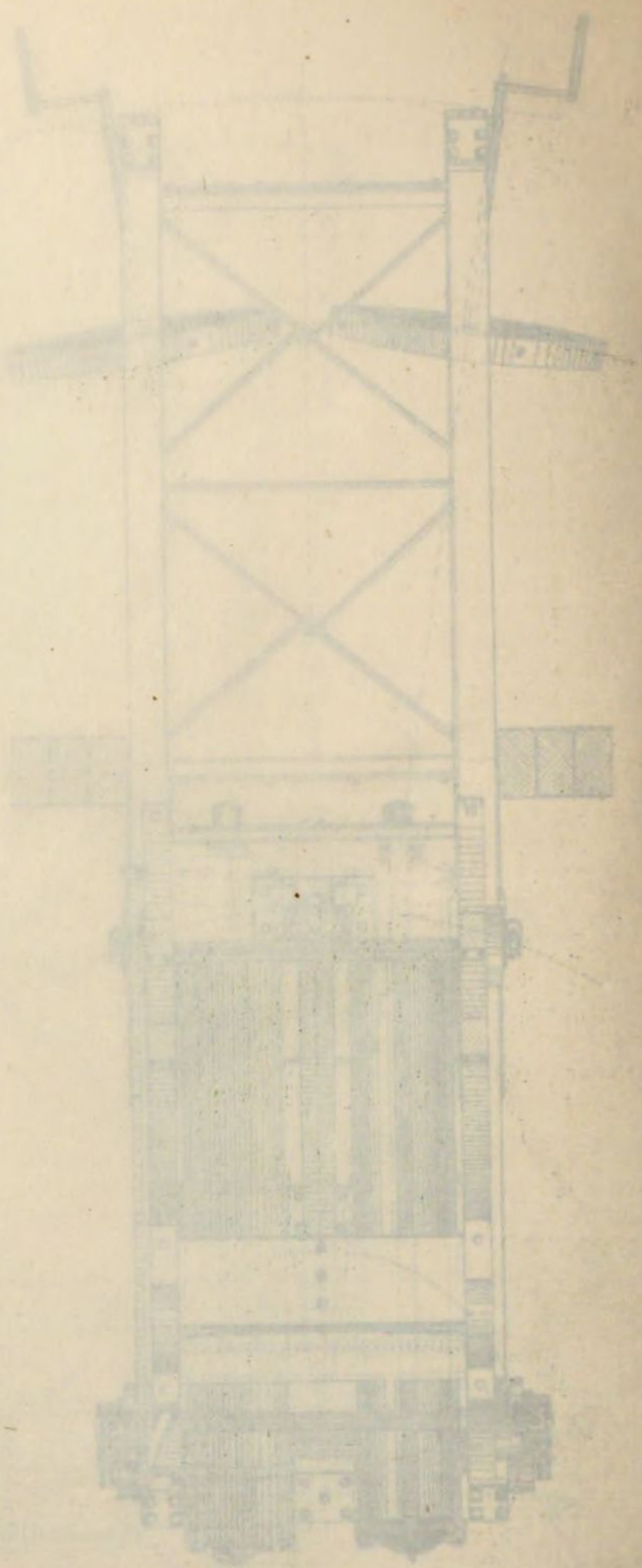
SECTION OF THE RIVER LAR CHURCH





SERVICE 15 INCH BARBETTE CARRIAGE
increased in height with two air cylinders

ПРОЕКТЪ ПЛАНИРОВКИ И ПОСТРОЕНИЯ
ЗАКАЗНИКА И ЕГО ПОДЛЕЖАЩИХЪ



DESCRIPTION OF MAJOR J. G. BENTON'S PLAN FOR MANEUVERING AND LOADING BARBETTE GUNS UNDER SHELTER OF THE PARAPET.

I. MANEUVERING.—The movements required in the operation of a gun mounted in a fixed battery are *six* in number, viz: *Elevating the muzzle; depressing the muzzle; traversing to the right; traversing to the left; from battery; and into battery.* The design of the plan is to effect all these movements by means of two chains, or ropes, worked by a windlass situated in a casemate built in the parapet. Plate I represents a pair of 15-inch guns mounted in the customary way between two traverses. It is proposed to place the casemate between the guns in the position marked by the letters A, B, C, D, and to use one windlass and set of men to work it, for both guns.

Four ropes are required to work the two guns, and each rope is attached to a loose reel, which is turned by the main shaft of the windlass. The reels are worked independently of each other by clutches, with hand "shifters." The windlass may be worked by hand-cranks or steam-power, as may be thought most desirable. The circle S, Plate I, shows the position which a portable steam-engine of the Baxter pattern might occupy. The details of the windlass are shown in Plate II.

Rope No. 1 passes from the first reel of the windlass around the friction-wheels $a, a', a'', a''', a^{iv}, a^v, a^{vi}$, and is attached to a staple on the under side of the gun, in front of the trunnions.

Rope No. 2 passes from the second reel around the friction-wheels b, b', b'', b''', b^{iv} , and is attached to a pin near the center of the base of the gun. Friction-wheel b^{iv} is immediately under a' .

When force is applied to rope No. 1, the muzzle is depressed, or traversed. To traverse the gun, it is necessary to lock the rope at friction-wheel a^{vi} , so that the force applied to the rope shall be exerted at the friction-wheels a''' and b' of the chassis. The application of force to rope No. 2 (reel No. 1 being out of gear) produces corresponding motions of the muzzle in the opposite directions.

When force is applied to both ropes at the same time, or to one rope with the traverse-wheels chocked to prevent the chassis from moving, the gun moves from battery. When both reels are thrown out of gear, and the maneuvering-wheels are in gear, the piece runs into battery by the force of gravity.

The rope E attached to the handspike of the eccentric of the rear maneuvering-wheels and passing over a pulley F, attached to the cheek of the gun-carriage, enables a gunner, standing under the shelter of the parapet, to put the carriage on rolling or sliding friction at will. The use of ropes permits the front eccentric wheels of the chassis to be dispensed with, and the chassis to rest at all times directly on the pintle-plate.

II. LOADING.—That the gunners may not be exposed while loading, the muzzle of the piece is depressed below the crest of the parapet, and to this end it will be necessary to use a jointed, sectional, or telescopic ramrod, as may be found most suitable in practice. The position of the muzzle when depressed for loading should be nearly over the front ends

of the air-cylinders L, Plate III. It is found in practice that the rebound after recoil leaves it nearly in this position.

The projectiles are arranged on a shelf, G, attached to the inner slope of the parapet, and are transferred to the muzzle on a carriage, K, which runs on an inclined tram-way, H. (See Plate III.) The tram-way may be a plank, to be pushed back between the air-cylinders when not required for use; or it may be made of iron, and permanently fixed to supports attached to the front part of the chassis. With the latter arrangement it will always be ready for use.

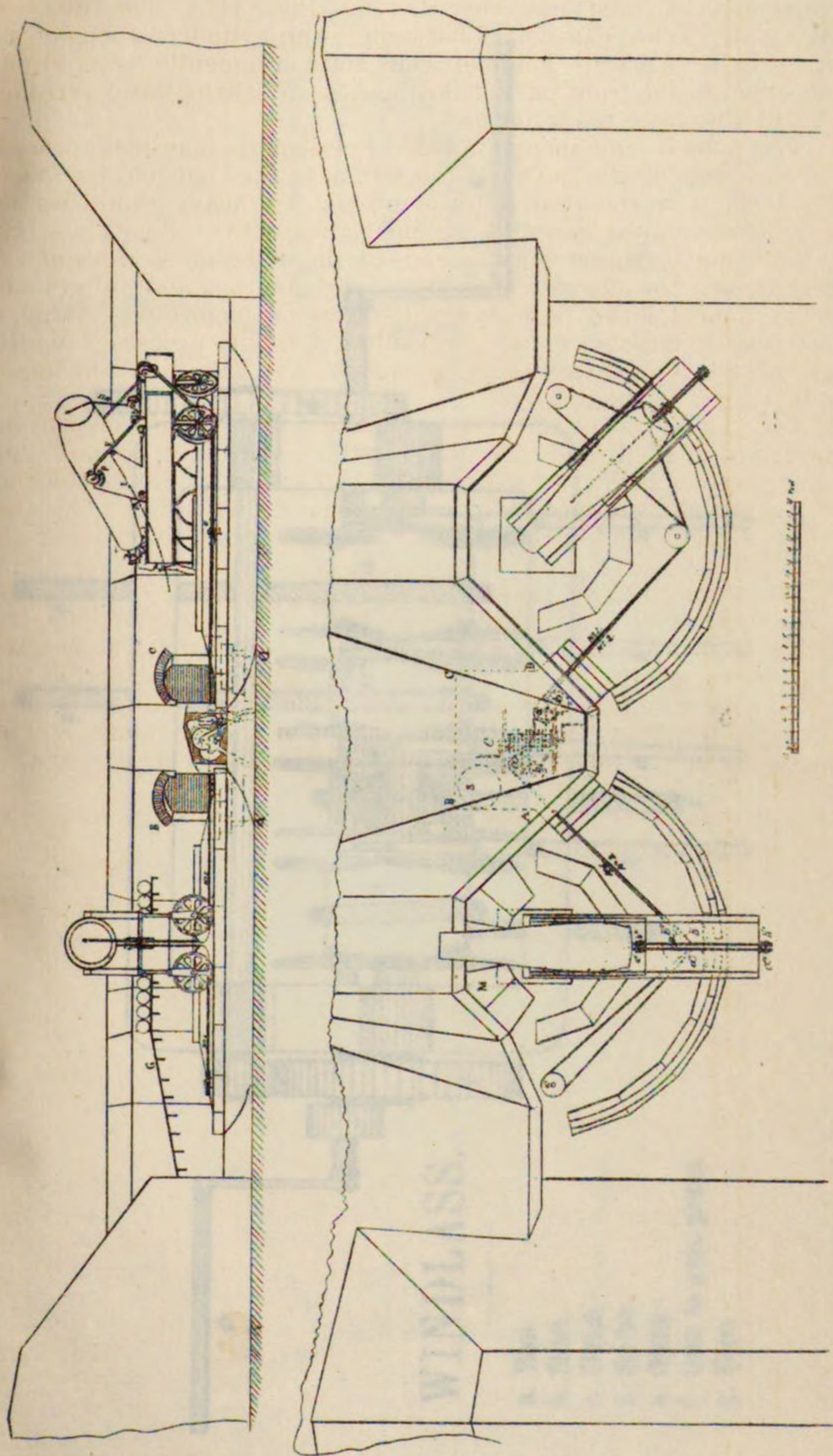
The ramrod and sponge, folded or closed up, may rest on hooks, one on each side of the railway; this will save the time and trouble of lifting them from the ground to the muzzle. For heavy projectiles the shot-carriage is moved by a rope, N, and pulleys, O O. (See Plate III.) By supporting in succession the ends of the different sections of the ramrod against the shot-carriage moved by the rope and pulleys, the ramming home of the projectile will be much facilitated. When an unsabotted round shot is used, in loading it is only necessary to roll it into the muzzle and elevate the piece some 2° ; it will then roll home without the use of the rod.

The gunners when in the act of loading may be sheltered from splinters, &c., of shells and case-shot bursting over and in front of a battery, by a piece of boiler-plate, M, Plates I and III, of suitable thickness, inserted in the parapet below the reach of direct fire. The casemate offers a convenient shelter for the gunners from the blast of the gun when fired.

III. PRIMING AND SIGHTING.—To prevent unnecessary exposure to men in priming and sighting, it is proposed, by way of trial, that the piece be mounted with the vent downwards, and that additional sights for directing the piece be affixed to the under side, and as near the cheeks as may be convenient for use. The elevation may be measured by a pointer attached to the end of one of the trunnions, and a corresponding arc attached to the outer surface of a cheek of the top carriage. (See P, Plate I.)

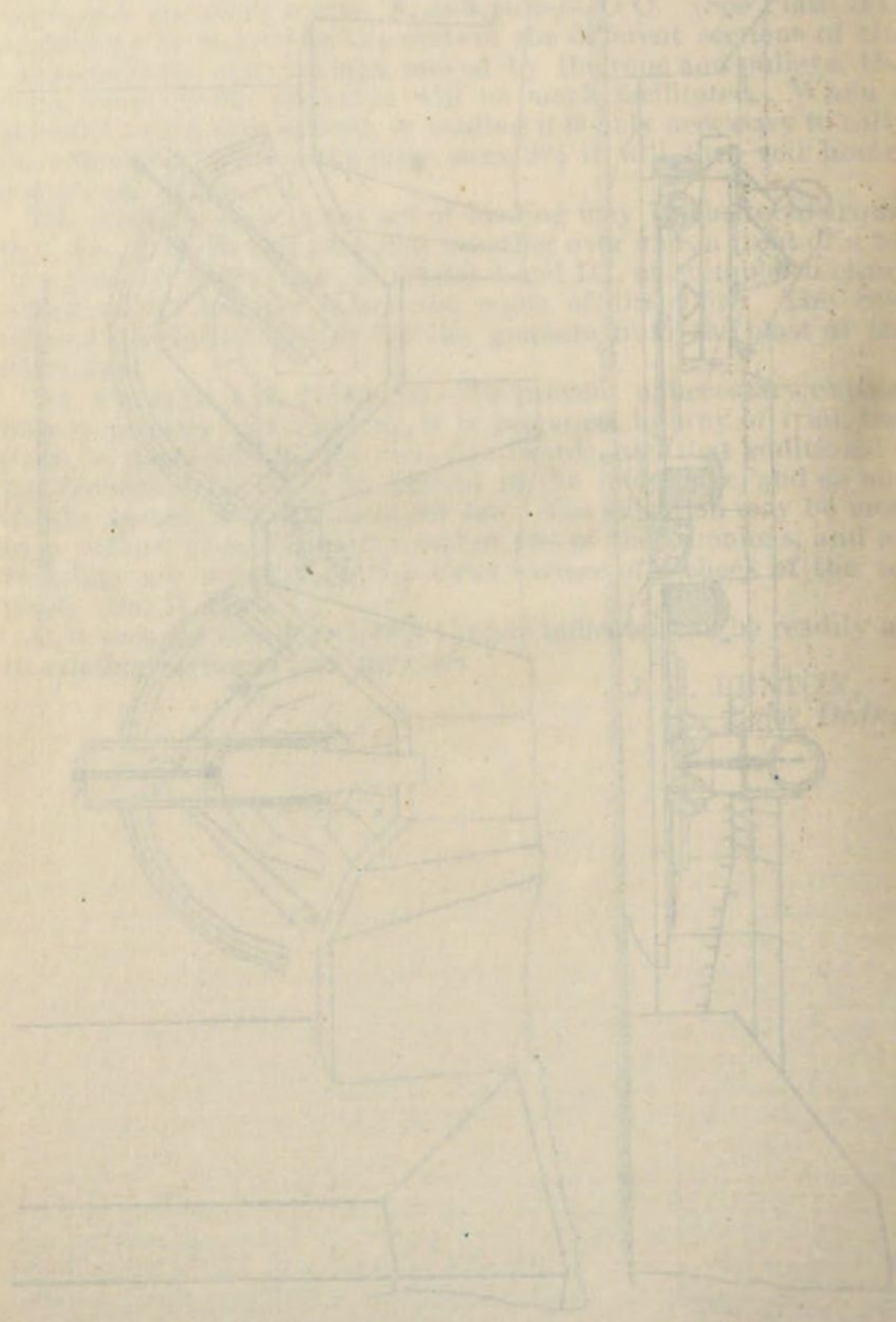
It is thought that the changes herein indicated can be readily applied to existing carriages and batteries

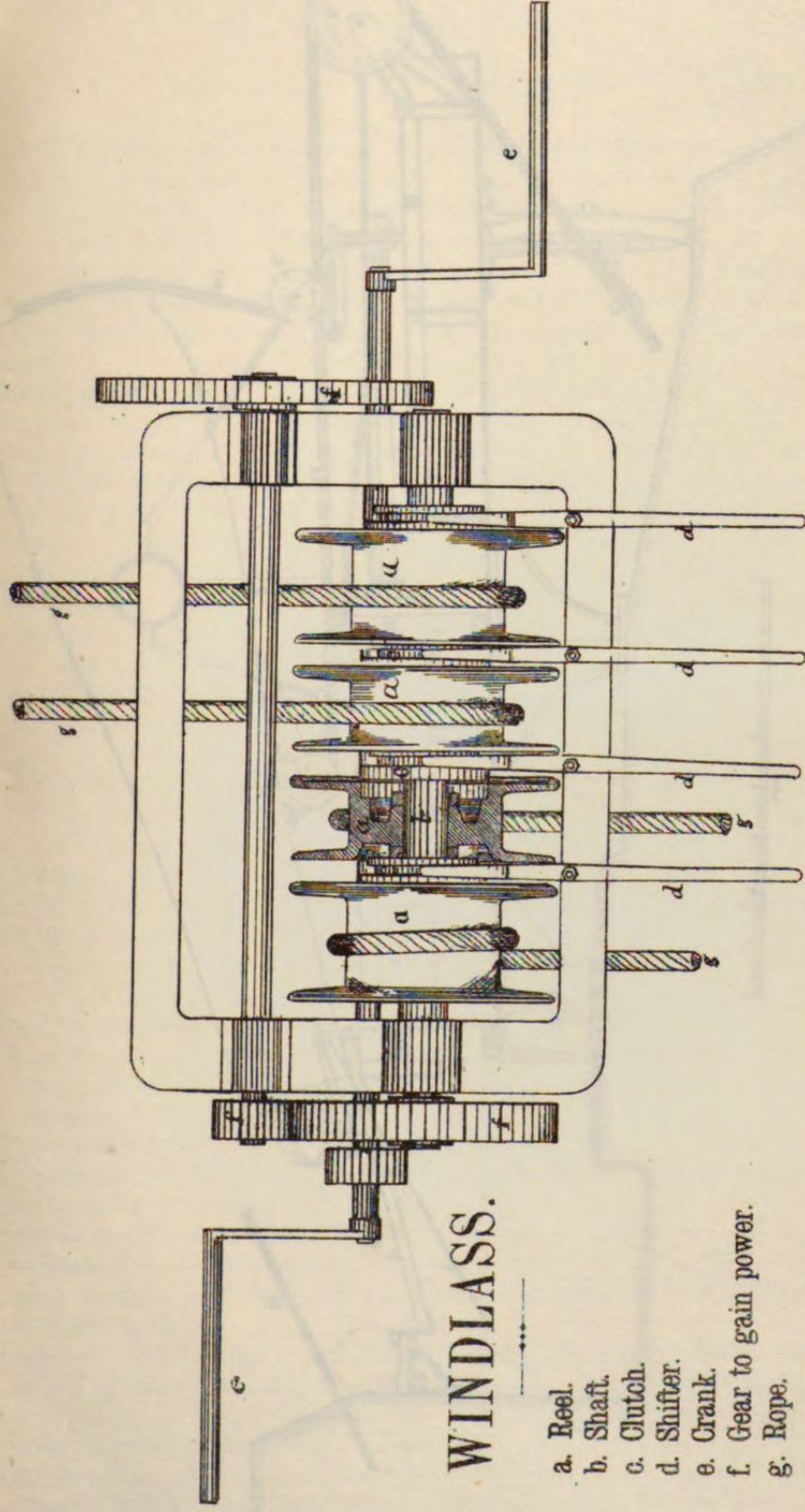
J. G. BENTON,
Major Ordnance.



BENTONS APPARATUS FOR MANŒUVRING HEAVY GUNS.

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WINDLASS.

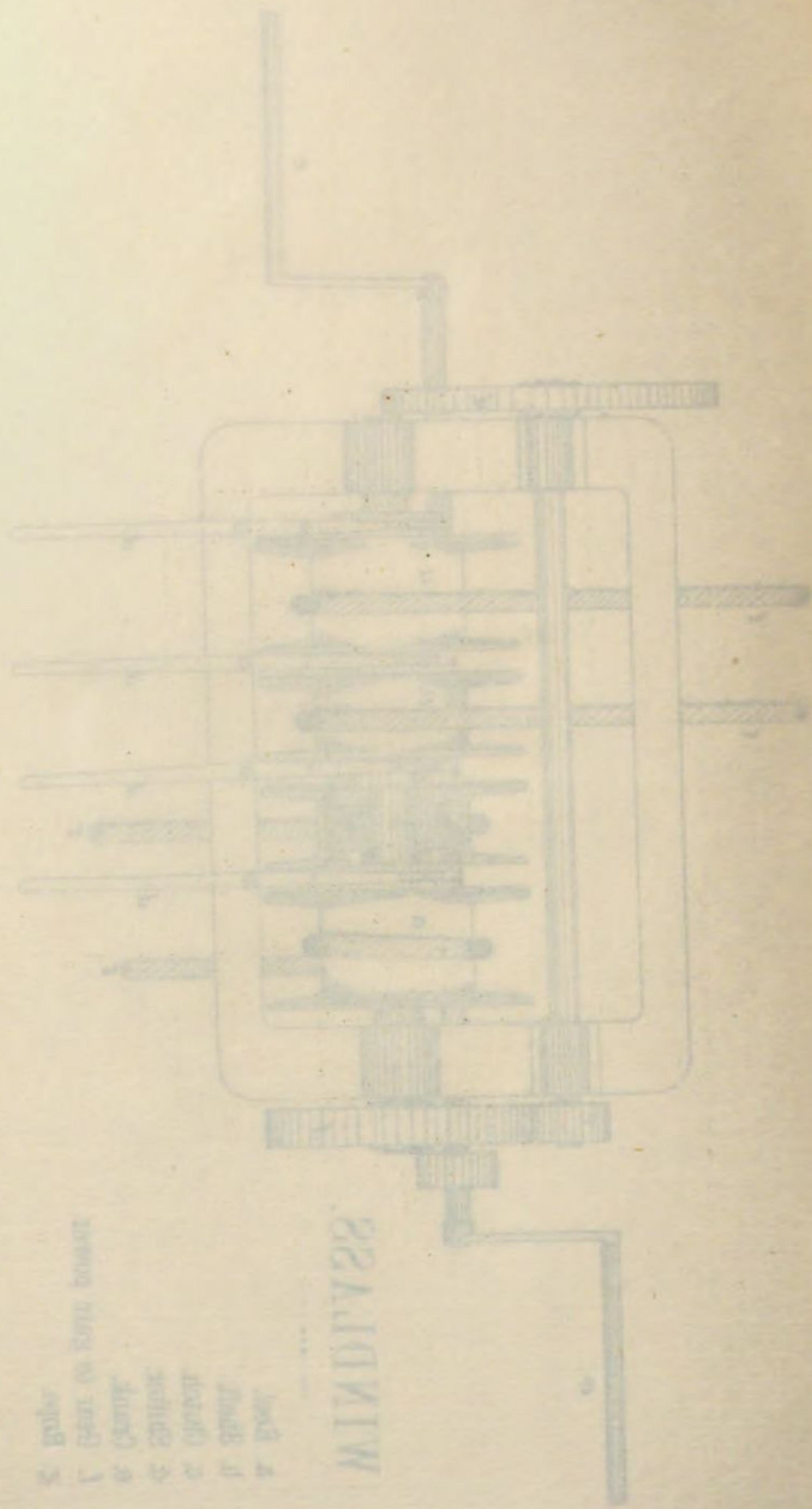
- a. Reel.
- b. Shaft.
- c. Clutch.
- d. Shifter.
- e. Crank.
- f. Gear to gain power.
- g. Rope.

BENTONS APPARATUS FOR MANOEUVRING HEAVY GUNS.

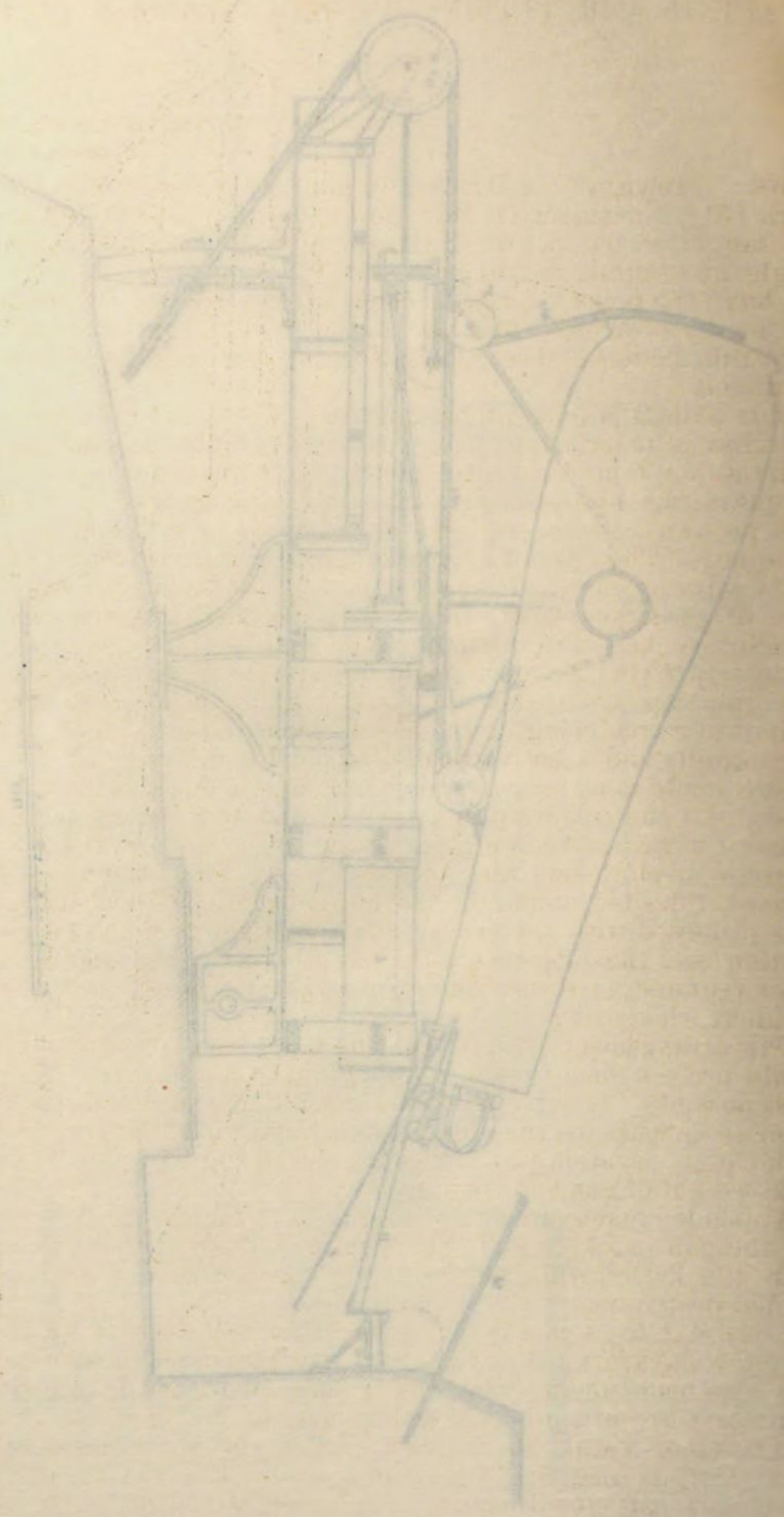
ПРИЛОЖЕНИЕ КЪ РУССКОМУ ПЕРВОМУ ИЗДАНИЮ

а. Вода
 б. Вода из колодезя
 в. Вода из колодезя
 г. Вода из колодезя
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ПРИЛОЖЕНИЕ



ВЕРТОНА УЛЬВАНДЕР КОВ. ИЮНОВА ИГО. ИГО. ИГО.



CAPTAIN A. R. BUFFINGTON'S COUNTERPOISE CARRIAGE.

CHARLESTON, SOUTH CAROLINA,
November 20, 1872.

SIR: A report of the Board of Engineers for Fortifications, dated New York City, November 11, 1871, points out the necessity for a change in the height of parapet of fortifications, and prescribes 11 feet breast-height as essential for the protection of cannoneers.

I have the honor to submit below a plan, devised by me, for mounting heavy ordnance, rifles, and smooth-bores, from 10 to 20 inches, to meet this change of breast-height and the demand for depressing gun-carriages.

This plan, it is thought, has great simplicity, would introduce no radical change of principle, being essentially a chassis and top carriage, adapted for front or center pintle platforms, requiring no change in the platforms now existing, and would make use of all chassis (iron, late pattern) now in use and stored away, and, therefore, has great cheapness. There is not a cog-wheel, chain, or permanent rope, essential to its working, on it. It has few parts in the sense of complication and ease of disarrangement, either from accident or carelessness. The principle of action is apparent to the simplest intelligence, and certain always, and very few men would be required to serve it.

A gun thus mounted would recoil parallel to its position when fired—limit of recoil being in the model presented for 15-inch gun, 11 feet horizontally and 5 feet vertically—about $13\frac{1}{2}$ feet rectified.

Gun would raise its shot and charge for reloading to the muzzle, could be sighted and traversed under cover, and need be exposed only at the moment of firing—counterpoise acting as a pressure without shock to carriage or pintle and without a *well* under the platform. A *well* could be used if desired, and in the case of front pintle, without the use of rope. It is proposed with the use of such a carriage to do away with sliding friction and thus dispense with eccentric axles on top carriages, the labor required to throw them “in and out of gear,” and one cause of accident when firing.

This arrangement, with the bearing parts kept constantly oiled, which would protect them from rust, would make the strain on the pintle the least possible. It is thought the eccentric axle of chassis could also be done away with, (as the shock to carriage would be very little unless under high elevation,) by increasing the strength of axle to sustain the dead-weight of gun and counterpoise.

Appended hereto are two photographs of the proposed carriage showing the gun (No. 1) in and (No. 2) out of battery. These, in connection with the model, will discover to you the nature of it without any extended description.

I desire it to be clearly understood that the model which I shall in a very few days forward to you, from which these photographs are taken, has been made under difficulties, is incomplete, and is intended simply to present to you a practical embodiment of the idea, the general outline being on a scale of one-twelfth actual size, for a breast-height of 11 feet. Only in case the Department should like the device would the study each part would require in its shape, strength, &c., be justified.

The carriage as presented is susceptible, in adapting the principle to use also of various modifications, that will readily suggest themselves if desired. The under part is the 15-inch front pintle chassis without eccentric axle and center bolsters, and modified (not necessary however) somewhat in the manner of uniting the rails. This is done to show the use existing chassis could be put to in the proposed carriage.

On a new one throughout, what corresponds to the present chassis would consist of but one part—two cheeks or rails joined together.

The remaining part of the carriage explains itself.

The principle of action of carriage and counterpoise is as follows, viz: Let $D E$ (Fig. 1) be a circle half as great as $A B$. If $D E$, be rolled around in $A B$, any point of its circumference, D or E , will describe a right line—a diameter of $A B$. Thus the point D will describe the line $A B$, and the point E the line $I H$. All other points of the diameter $D E$ of smaller circle will describe ellipses, also all points of $D E$ produced either way. Thus the point F will describe in one half-turn of circle $D E$ the arc of ellipse $x y$. Suppose the circles and all lines in Fig. 1 removed but $C A$, $C y$, $D F$, and $x y$, and the points D and E be made to move on the lines $A C$ and $C y$, the same action will obtain—the point F will describe as before the arc $x y$, and the points D and E will preserve their relative motions the same; that is, in all velocities of the circle $D E$ (rolling around inside of $A B$) D will be at its maximum when E is at its minimum or zero, and *vice versa*, and the velocities may be said to be reciprocals of each other.

When E is at C , and D at A , E is at its maximum, and will move a considerable distance on line $I H$, either way from the point C , before D perceptibly moves. This distance increases as the line $D E$ increases, and when it is made 6 feet, as in proposed carriage, and the further increase added for the elliptical arc, 5 feet beyond the point E , it will be seen that the gun in recoil would acquire its full velocity and move 2, 3, or more feet before the counterpoise (which would correspond to the point D) would be perceptibly affected; it would thus act as a pressure, and as an increasing pressure, for the velocity of D would be accelerated by an increasing increment constantly developing the inertia of counterpoise.

The lines $A C$ and $C y$ then correspond (when top carriage lines are reduced to one, and wheels to points) to the front and top of chassis, cheeks, or rails of proposed carriage; the line $D F$ to the parts supporting the gun, or what may be called the top carriage, whose wheels roll up and down and to and fro on lines $A C$ and $C y$, respectively; and the elliptical arc $x y$ to the path described by the center of inertia, corresponding to point F , of gun in recoil.

It is presumed what follows may approximate to a correct notion of the work performed by the gun in recoil, neglecting friction, which it is thought is essentially a matter of experiment.

The curve $A Y$ (Fig. 2)—the path described by the center of inertia of the gun when recoiling—is the fourth part of an ellipse, whose semi-conjugate axes are $D q$ and $r q$.

If the gun is a 15-inch gun, and recoils with a velocity of 12 feet in the first instant, the quantity of work required to bring it to a state of

rest will be expressed by $\int ds \cdot P = \frac{MV^2}{2}$; S being the path and P the intensity of the force. $M = \frac{W}{g}$; W in round numbers equals 50,000

pounds, making $g = 32$, and substituting, we get $\int ds \cdot P = 112,464$ foot-pounds. Added to this must be the work of the weight during the recoil.

The weight in its action will be divided into components parallel and perpendicular to the line Dq —the perpendicular component only working with the force of recoil.

Let (Fig. 2) q be any point, and if Sq represent the weight, qt and St will represent these components, respectively, for the point q . Make $qr = R$, ($= 5$ feet in model,) $qs = W$, $pq = y$, and $pX = x$. Then—

$$St : pq :: qS : qr.$$

$$\therefore St = \frac{pq \cdot qS}{qr} = \frac{W}{R} y$$

But—

$$y = \sqrt{2Rx - x^2}$$

$\therefore St = \frac{W}{R} \sqrt{2 \cdot Rx - x^2} = P' =$ the intensity of perpendicular component at any point.

Then—

$$\int P' \cdot ds = \int_{x=0}^{x=R} \frac{W}{R} \cdot dx \sqrt{2Rx - x^2} = \frac{W}{R} \int_{x=0}^{x=R} dx \cdot (2Rx - x^2)^{\frac{1}{2}}$$

$$= \frac{W}{R} \pi \frac{R^2}{4} = 196,350 \text{ foot-pounds, which, added to the above, gives}$$

308,814 foot-pounds. From this the work of the other component must be subtracted.

Let (Fig. 2) $pr = z$ and $rh = 1$ foot, (radius of top carriage wheels—diameter, however, of model wheels;)

Then—

$$qt : pr :: Sq : rq$$

Or,

$$qt : z :: W : R$$

$$\therefore qt = \frac{W}{R} z = \text{intensity of parallel component;}$$

but in its action it will vary as the sine of—

$$prq = \sin \varphi \text{ (measuring from } rX) = gh = lm = vn$$

$$\therefore \sin \varphi \cdot qt = \frac{W}{R} \cdot z \sin \varphi = P'' = \text{working intensity at any point;}$$

but

$$z = R \cos \varphi, \text{ and } \cos \varphi = \sqrt{1 - \sin^2 \varphi}$$

$$\therefore z = R \sqrt{1 - \sin^2 \varphi}$$

From which we get

$$\sin \varphi = \frac{1}{R} \sqrt{R^2 - z^2}$$

and, substituting, we have

$$\sin \varphi \cdot qt = \frac{W}{R^2} \cdot z \cdot \sqrt{R^2 - z^2} = P'' \therefore \int P'' \cdot ds = \frac{W}{R^2} \int z \cdot dz \sqrt{R^2 - z^2} =$$

$$\frac{W}{R^2} \int z \cdot dz \cdot (R^2 - z^2)^{\frac{1}{2}} = \frac{W}{R^2} \frac{(R^2 - z^2)^{\frac{3}{2}}}{\frac{3}{2}}$$

and between the limits zero and R we have

$$\int P'' \cdot ds = \frac{W \cdot R}{3} = 83,333 \text{ foot-pounds,}$$

which subtracted from above gives 225,481 foot-pounds for total quantity of work, and, divided by six, (6,) the number of feet the counterpoise must be raised, gives 37,580 pounds, five-sixths of which, (as the gun and counterpoise act on arms of standards in model 5 and 6 feet respectively,) 31,316 pounds, is the weight, to raise which 6 feet, under the circumstances obtaining in proposed carriage, would require 225,481 foot-pounds of work.

Let us add about 10,000 pounds for friction; this would make the counterpoise about equal to Major King's; also about equal to the weight required to balance the gun when in the loading position, that is, five-sixths of 50,000 = 41,666 pounds.

The counterpoise must equal this weight, plus something more than necessary to overcome the friction of starting the gun into battery.

Thus, it will be perceived, there is an ample margin for all charges that give greater velocities of recoil than 12 feet the first instant, and that the gun would never recoil the full limit to injuriously shock or break the carriage; also that the gun, about balancing the counterpoise, would be easily (by the means shown in photographs and model) placed,—pulled down—even in drilling, without firing, in the loading position, as shown in photograph No. 2.

The wheels of top carriage could be made with flanges and run upon rails for greater stability, if required.

If at any time the counterpoise should not run the gun fully into battery, and such force as two or three men on each side could apply—in a manner indicated by the swinging bars attached to the model—would not be sufficient, a horizontal ratchet on each side, and a hand-spike suitably made to find in it a fulcrum, and to work against the rear standards, would give an ample power for that purpose.

But it is thought the inertia of the gun would always be sufficient to carry it fully into battery, without—from the nature of the action of the counterpoise—injurious shock to carriage or displacement of projectile in bore of the gun. The action of the pawls and vertical ratchets needs no explanation; a different device could be placed on a large carriage without springs, and the action brought simultaneously on both pawls.

Sixty cubic feet of lead would give a counterpoise of, in round numbers, 42,500 pounds. Space for this and much more is easily obtainable, as indicated in the model. In its disposition around the axle supporting it it should be so arranged as to bear equally, or more, on the rear standards. This is accomplished by placing center of gravity of counterpoise to the rear of the axle, and connecting it (the axle) to pieces connected with the rear standards by square holes, thus making the rear standards support the leverage of the counterpoise.

All these parts would require strength, but it is thought no difficulty would be met in actual practice to accomplish all that has been attained in the little model. The loading, being near the high parapet, would have to be done by means of a "telescopic rammer," something already devised.

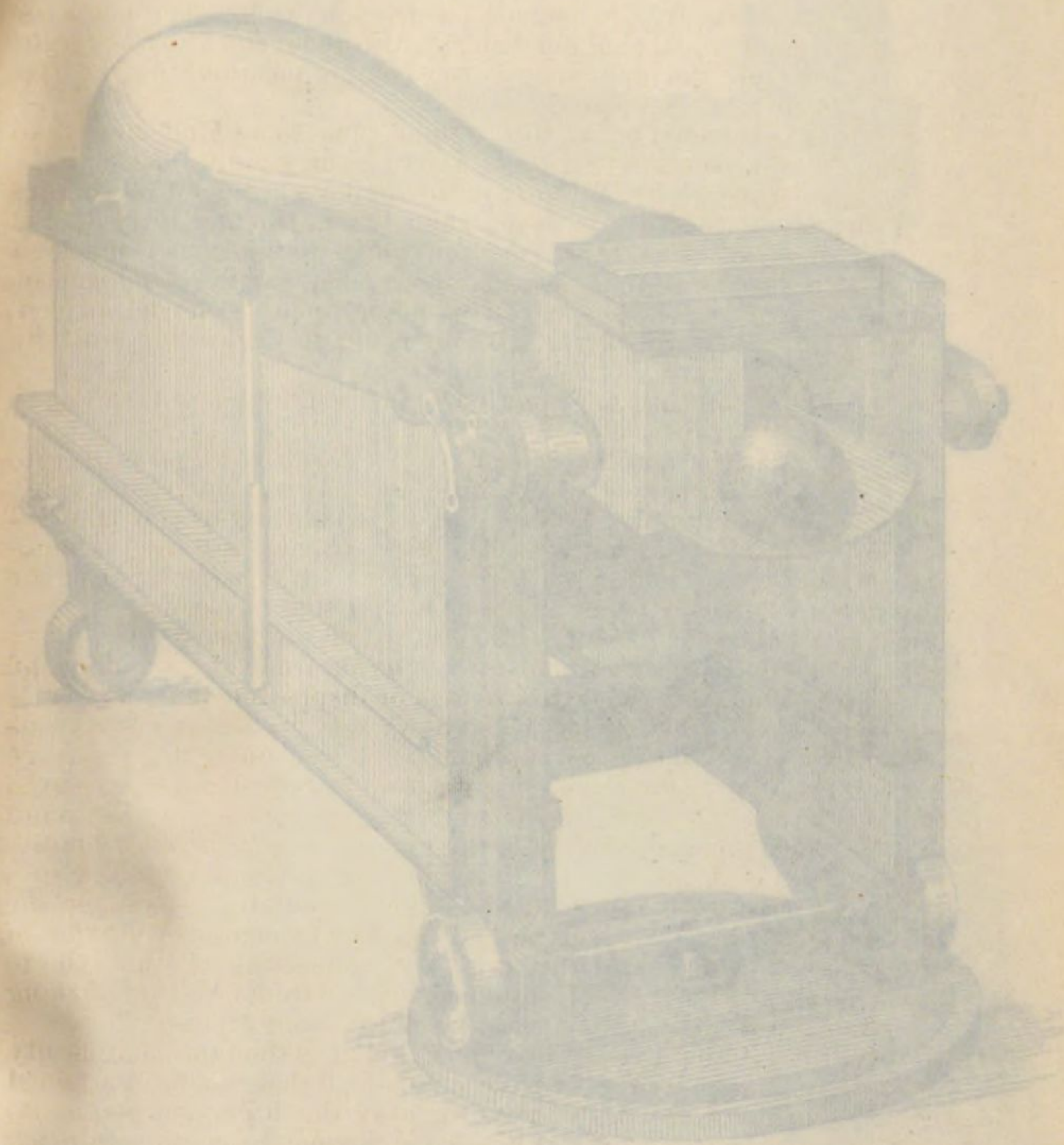
Respectfully, your obedient servant,

A. R. BUFFINGTON,

Captain of Ordnance, in Charge Armament Southern Forts.

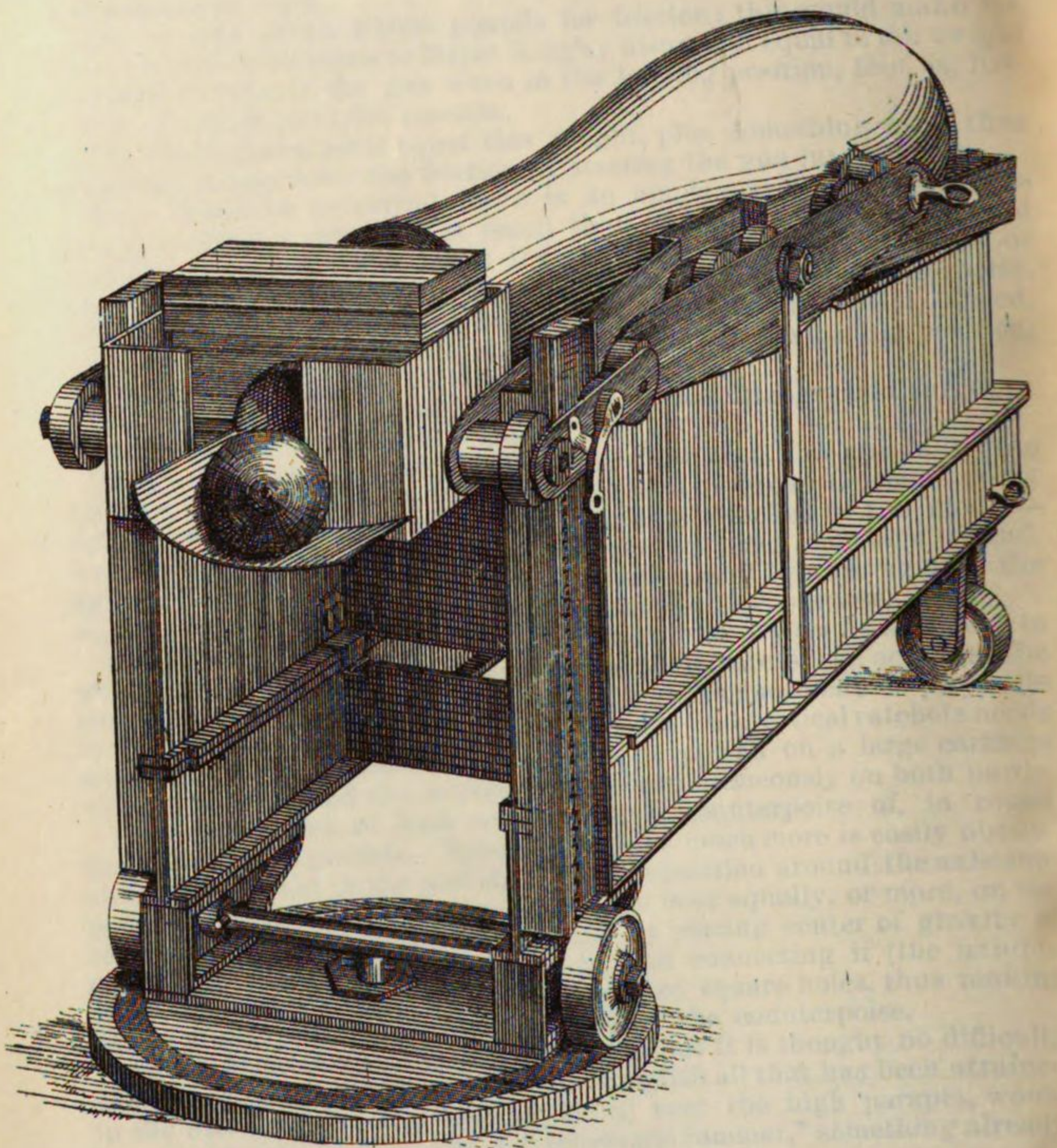
General A. B. DYER,

Chief of Ordnance, United States Army, Washington, D. C.



BUFFINGTON'S COUNTERPOISE GUN CARRIAGE

View in position for loading (front)

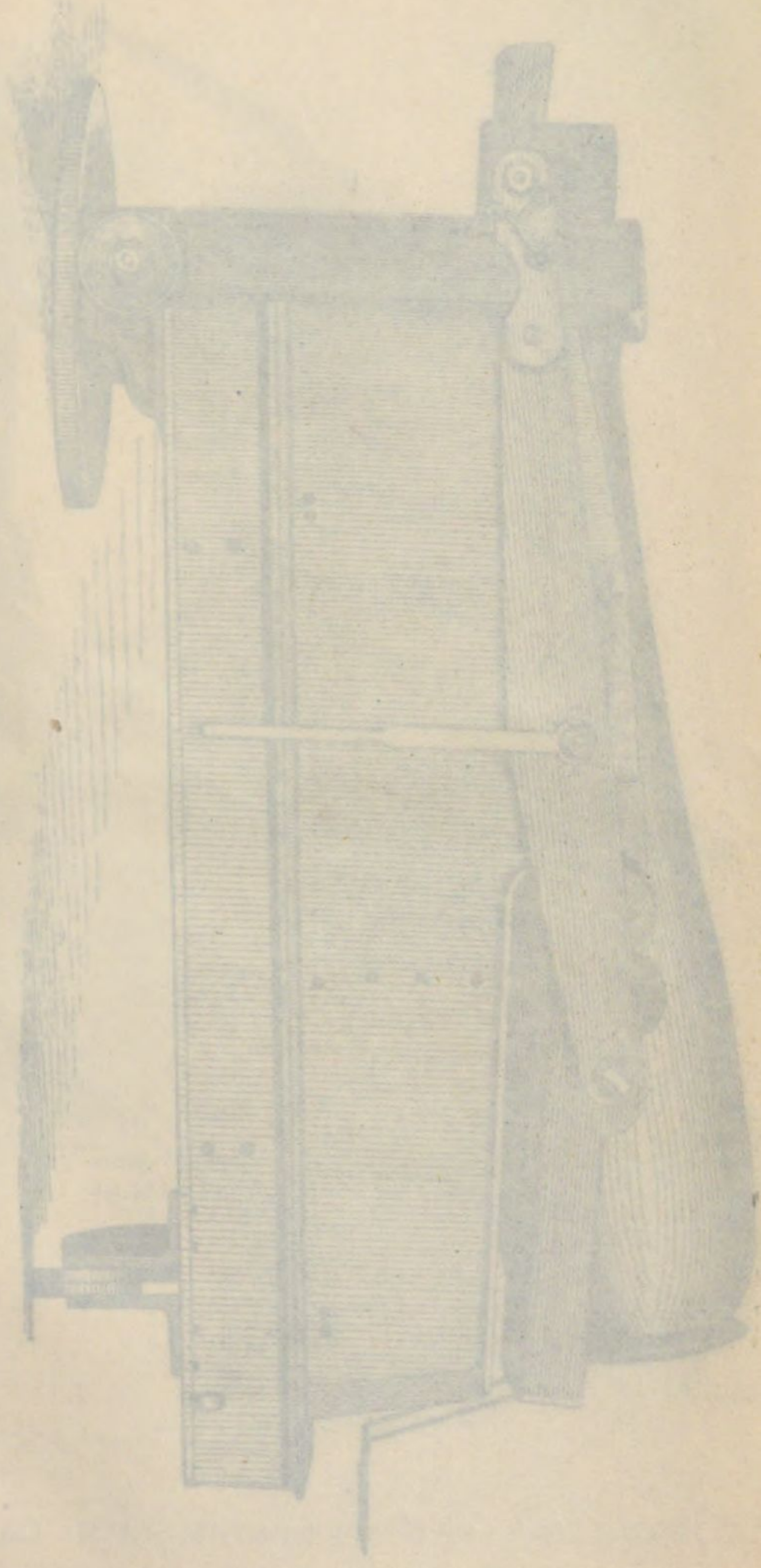


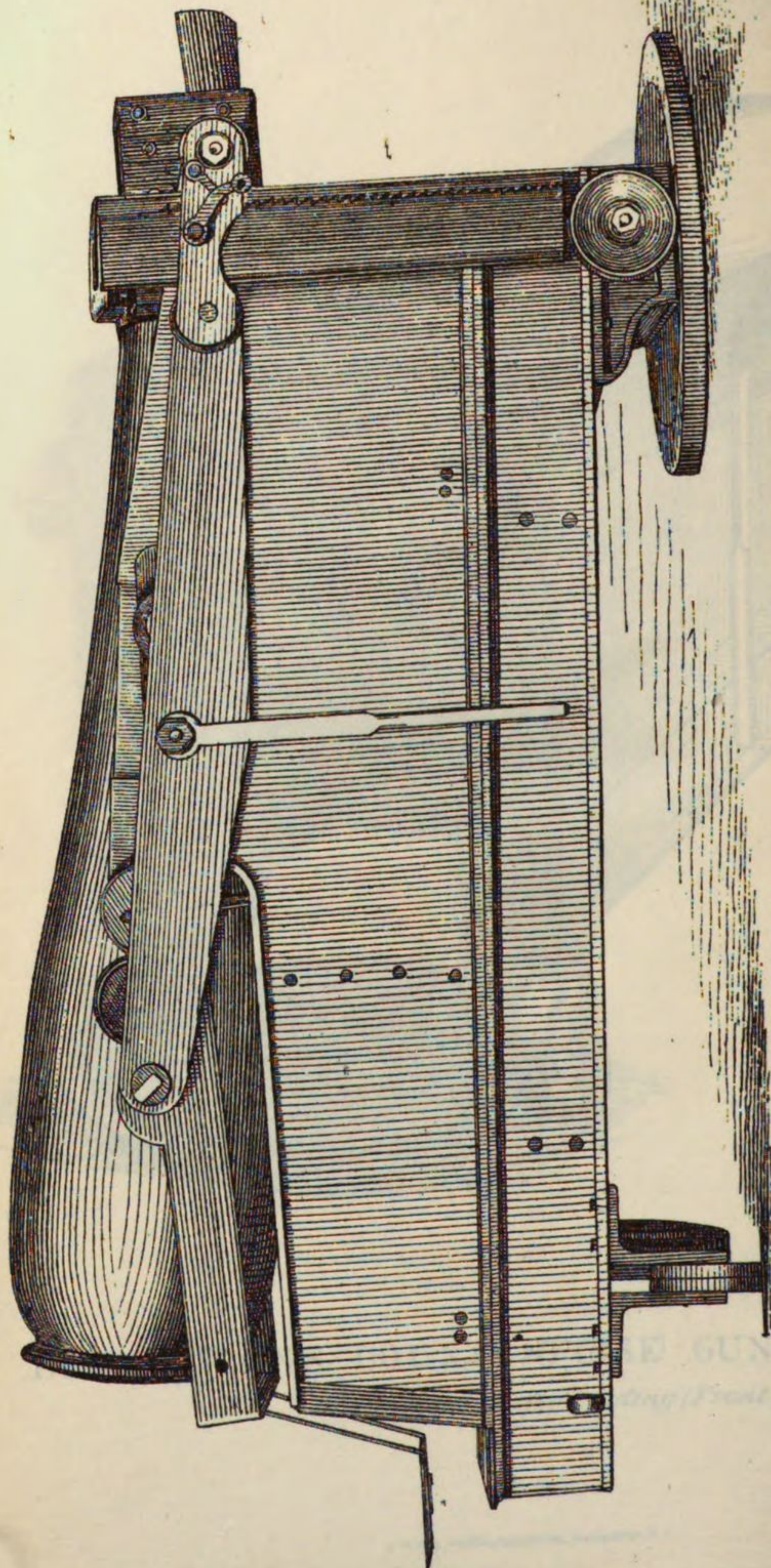
BUFFINGTONS COUNTERPOISE GUN CARRIAGE

View in position for Loading (Front)

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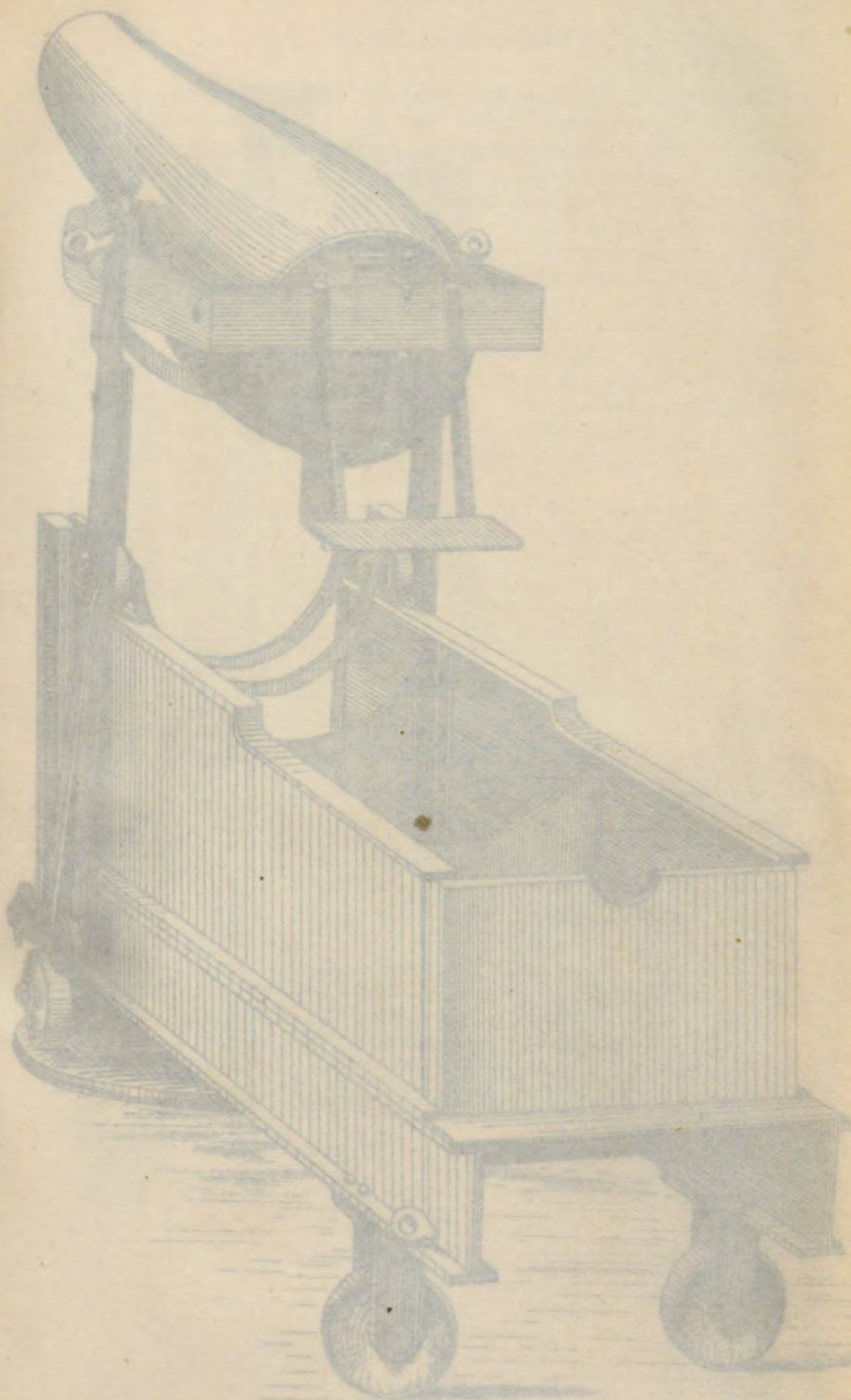
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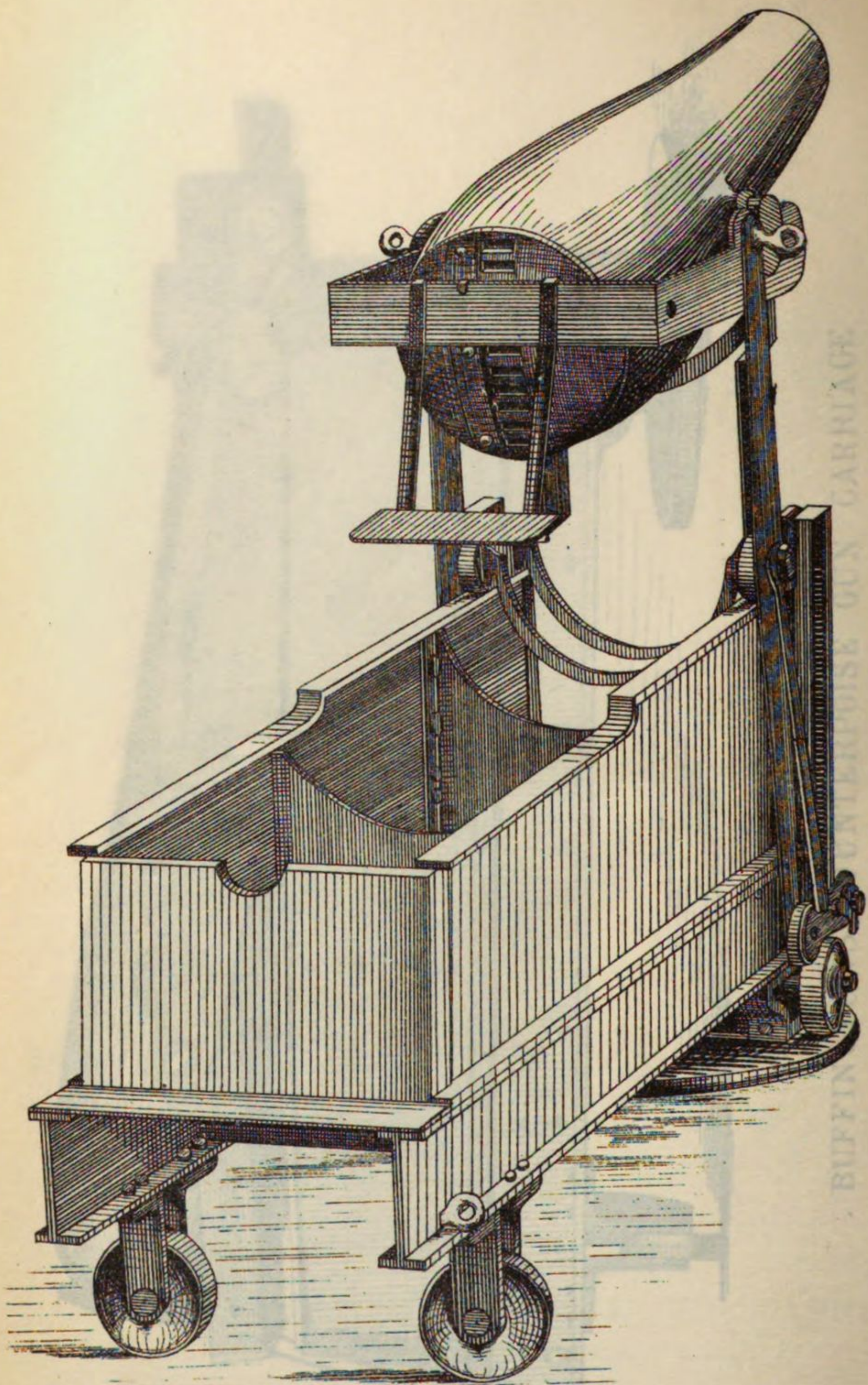


BUFFINGTONS COUNTERPOISE GUN CARRIAGE

View in position for Loading (Side)



BUFFINGTON'S COUNTERPOISE GUN CARRIAGE
Here the position for firing (Rear)

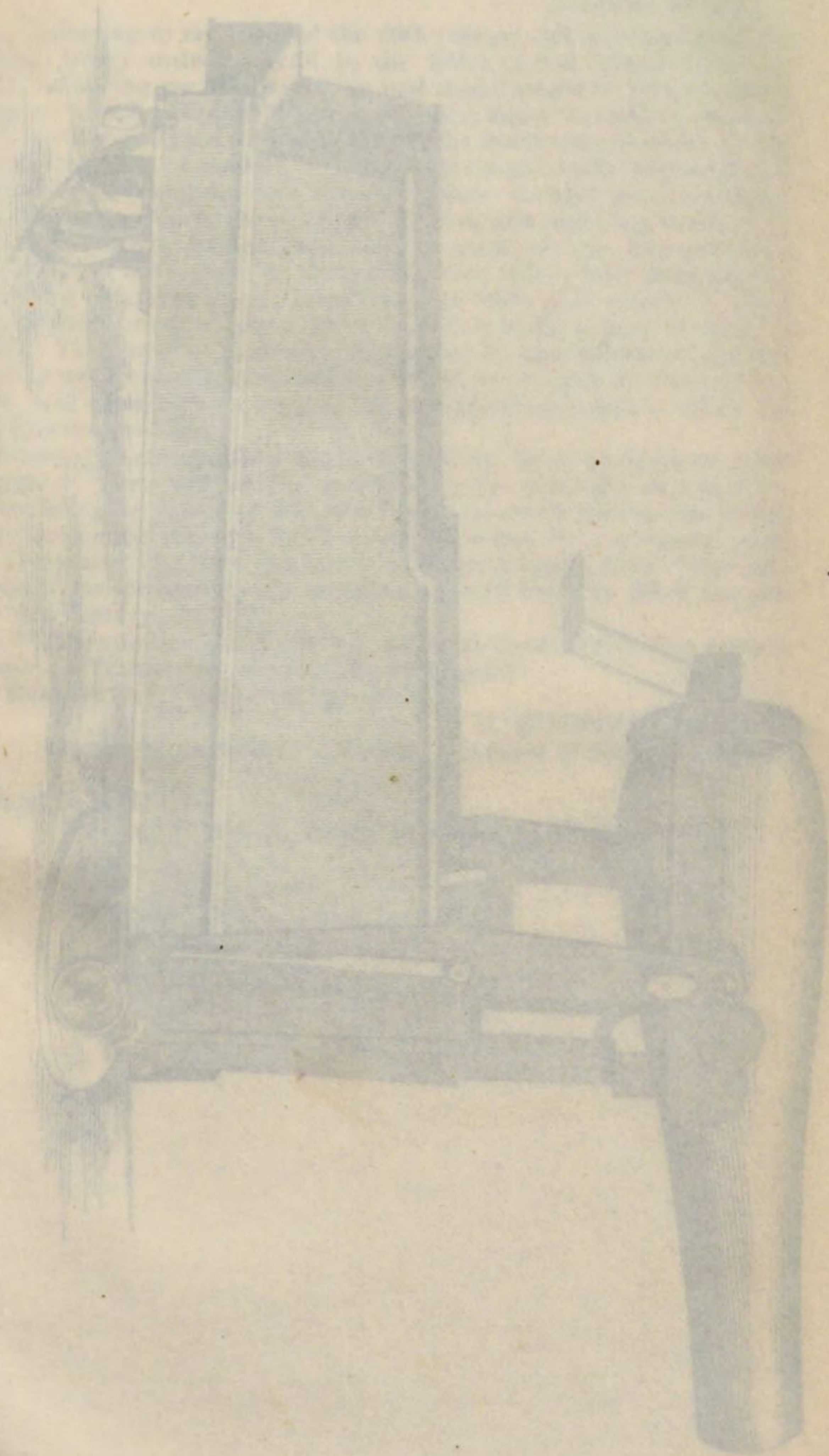


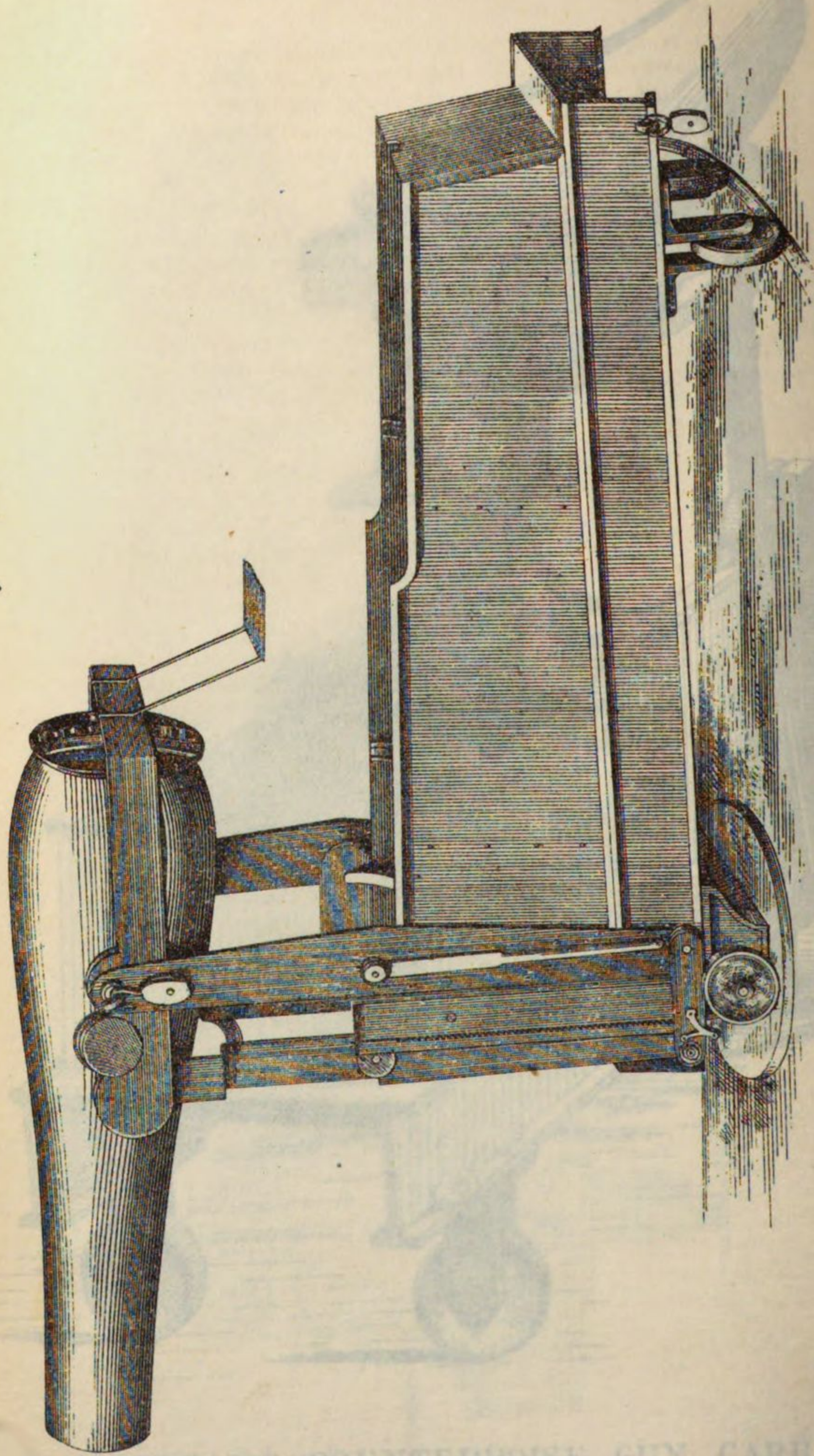
BUFFINGTONS COUNTERPOISE GUN CARRIAGE

View in position for Firing (Rear)

1898 in Boston (in 1898)

BRILLIANT CONSTRUCTION OF CANNON





BUFFINGTONS COUNTERPOISE GUN CARRIAGE

View in position for Firing (Side)

BUFFINGTONS COUNTERPOISE GUN CARRIAGE

View in position for Firing (Rear)

CHARLESTON, SOUTH CAROLINA,
November 29, 1872.

SIR: Referring to my paper of the 20th instant, submitting a plan for mounting heavy ordnance, and to the letter of 23d instant from the Bureau, informing me that said plan and model would be referred early in January to a Board of Officers, I have the honor to explain, more at length, for the information of the Board, the statement referring to the pawls and ratchets of model: "A different device could be placed on a large carriage without springs, and the action brought simultaneously on both pawls." Where the pawls are located, and replacing them, gear-wheels may be put, one on each side, to work (always engaged) in a vertical ratchet having similar teeth. On each side, where disengaging-lever is, and replacing it, on the same arbor with gear-wheels, a wheel may be placed, provided with closely-made teeth for a pawl above it to work in. This pawl so made that when thrown forward its weight will cause it to work constantly in teeth of wheel, as the gun is running from battery, and when thrown back to be entirely disengaged, to allow the gun to run into battery.

This arrangement could be made self-acting by projections on lower front part of carriage to *set* the pawls when the gun runs into battery, thus providing against any neglect of cannoneers to reverse the pawls, and by connecting them by light chains or ropes to a common arbor about the center and lower part of chassis, they could, from either side of carriage, be simultaneously reversed (thrown back) to allow the gun to run into battery.

The "telescopic rammer" referred to is an invention of the master-carpenter of Watertown Arsenal, Massachusetts.

Respectfully, your obedient servant,

A. R. BUFFINGTON,
Captain of Ordnance, in Charge Armament of Southern Forts.

General A. B. DYER,
Chief of Ordnance, United States Army, Washington, D. C.

CAPTAIN J. WALL WILSON'S CARRIAGE.

[Extract from pamphlet of Captain John Wall Wilson, United States Revenue Marine, on the gun-carriage invented by him.]

A statement of the merits and operation of this carriage and its superior advantages over any gun-carriage now known or in use.

SIMPLICITY.—This carriage has no geared machinery of any kind, no eccentrics, except those used in the compressors, and no levers to be shipped or unshipped, and is always upon its trucks.

The gun and carriage can be kept constantly ready for action, the only preparations needed being simply the insertion of the small *quoins* to their full length beneath the rubber cushions in each slide, and throwing the compressor-bar, or lever, back to the catch. If necessary to check the recoil more suddenly, the additional *quoins* can be used. The method of working the carriage is so simple that any one of slight intelligence can understand it, and in the darkest night no delay is caused by shipping levers, or adjusting any of its parts. The carriage can be taken apart and any of its pieces, if broken or disabled, replaced without trouble or delay.

FACILITY FOR WORKING.—The much greater facility with which a carriage can be handled upon this principle, compared with the regulation slide-carriage, enables, when used as a broadside carriage, both broadsides to be worked at the same time by a much less number of men than are now required. This carriage, with a 100-pounder Parrott gun mounted on it, has been worked under rapid firing with ease by *four* men.

DURABILITY.—The slide and after-trucks of this carriage being packed with rubber, and the recoil being checked by a *gradually increased resistance*, both the metal and deck are relieved from the sudden shock produced by the old method. This carriage is first held loosely, and the compression, tightening as it recedes, increases the friction, thereby preserving the *life* both of the gun and carriage.

REDUCTION IN WEIGHT.—The present 100-pounder wooden-pivot carriage and slide weigh 8,614 pounds; the Government 100-pounder iron-pivot carriage and slide weigh 7,060 pounds, while Captain Wilson's carriage and slide for guns of the same caliber weigh but 4,036 pounds. This great decrease in weight will enable a vessel to carry more and heavier guns if necessary on her upper deck, or a larger quantity of coal, and thus render her less crank and consequently more seaworthy.

REDUCTION IN SIZE.—The slide for the present regulation-carriage for 100-pounder guns is 13 feet and 5 inches long; the length of the slide for this carriage, for guns of the same caliber, is but 11 feet and 1 inch. This shortening of the slide 2 feet and 4 inches saves the room on deck, which is of very great importance in the narrow-beam ships of the present day.

EQUAL COMPRESSION.—By the principle, as carried out in the working of this carriage, the compression is absolutely equal on each side of the slide. This overcomes the tendency of a carriage to *twist* when the gun

recoils, by the unavoidable inequality of compression in the old method. The compressor-rod passing through the carriage closes or releases both compressors at *the same time* with *one movement* of either compressor-bar.

NO "CHOKING OF LUFF."—In this method no "choking of luff" is required after firing. The carriage takes care of itself after the recoil, and remains in position until released, no matter how heavily the ship may roll.

RECOIL.—The recoil can be regulated and stopped at any point desired on the slide, beyond a distance of 3 feet.

CENTER-PIVOT.—This carriage needs *only* a center-pivot, with no other fastenings of any kind upon the deck, thus enabling the gun to be fired at any point of the compass with the greatest rapidity, even, if desired, to sweeping the decks. To gain this point has been the study of ordnance officers for a long time. (*Vide Scientific American* of February 19, 1870.)

The well-known tendency of the muzzle of the gun to rise in firing is entirely overcome in the principle of this carriage, by the breech of the gun being *forced up* as the carriage recoils on an inclined plane. This is one of the most important principles of this invention, as it thereby does away with the necessity of a fastening at the forward end of the slide, when used as a pivot-carriage. This carriage can be used equally as well for a *broadside* carriage, the slide being so much shorter than the regulation-slide.

GREATER ACCURACY IN FIRING.—The slide and carriage being both cushioned with rubber, and the carriage being allowed to *recede easily at first*, the gun is not wrenched from the line of fire, as now, when the carriages are *firmly and rigidly held* by the old method, or when resting upon too solid a foundation. Experiments to test this principle were extensively made by the French government in 1865 and 1866, and completely proved the truth of this theory, the result of their experiments being eminently satisfactory after firing 3,000 rounds. The firing of the 100-pounder Parrott gun upon this carriage at the West Point foundry also proved this theory to be correct, as every succeeding shot struck precisely in the same place. This remarkable accuracy was commented upon by the men who worked the gun, and the firing was pronounced by them to be the most perfect they had ever witnessed during an experience of fifteen years.

RUBBER.—The after-trucks of the carriage have a *cushion* of rubber over each of them, and, when the gun recoils, are pressed up into the boxes, allowing the friction-plates to bear upon the slide. In other words, the after-trucks work *automatically*, the carriage resting again upon the trucks the moment the compression is released. Rubber, when properly vulcanized, is of an extremely durable nature, and is not liable to damage by hot or cold climates, nor salt water.

Responsible manufacturers of rubber guarantee it to retain its efficiency and elasticity, when well made, for ten years. The cost of the rubber complete for the heaviest carriages will not probably exceed \$100. In proof of its lasting durability, it is an established fact that rubber has been used for the past twenty years in South and Central America, the East and West Indies, Egypt and other *hot* climates; in Canada, Russia, and other *cold* climates, for car-springs and other purposes, where it has been equally exposed to weather of all kinds and all temperatures with the most satisfactory results. Reference in support of this statement is here made to the accompanying certificate of Professor E. N. Horsford of Harvard University, the well-known authority on

rubber, and to others most largely interested in its use throughout the different tropical and cold climates.

“LEE ROLL.”—The “lee-roll apparatus” is a very simple method of compressing the battens beneath the carriage against the inner sides of rails, thereby producing sufficient force and friction to enable the carriage to be held with ease *immovably* at any point on the slide required when the ship is rolling.

FORTIFICATIONS.—This carriage is as well adapted for fortifications as it is for naval purposes. The apparatus for “lee roll,” however, would be unnecessary in fortifications, the gun being always “in battery.”

RELATIVE COST.—This carriage can be built at a much less cost than any carriage of the same size now known.

CAPTAIN W. R. KING'S RIFLE
 CASEMATE-GUNS AND PROTON
 GUNS

In the art of iron, or in fact any material, the first and most important thing to be considered is the weight of the gun barrel. To construct this as to be light, the gun barrel must be of iron, or in fact any material, the first and most important thing to be considered is the weight of the gun barrel.

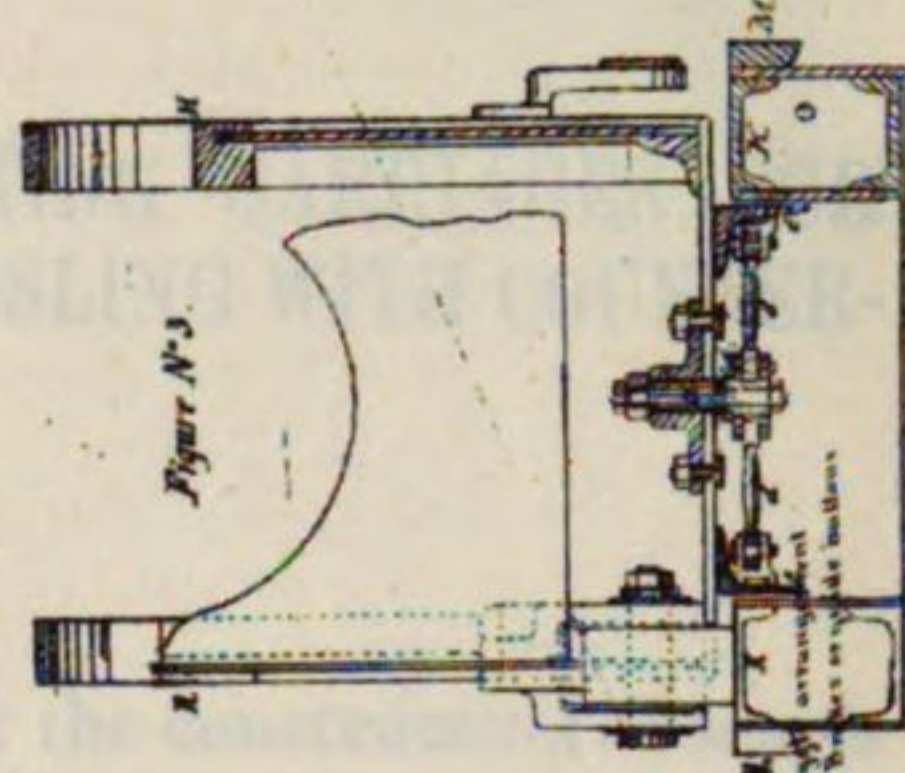
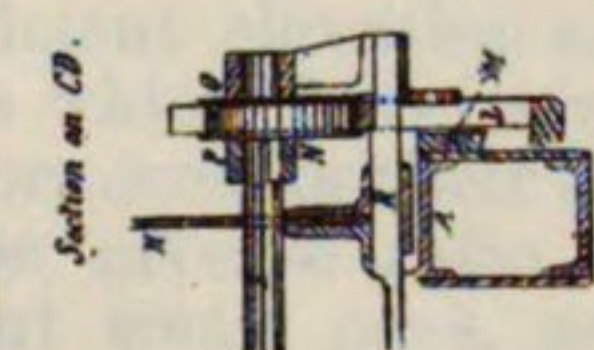
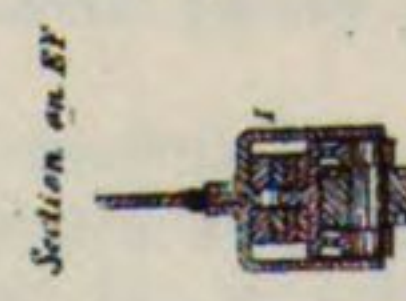
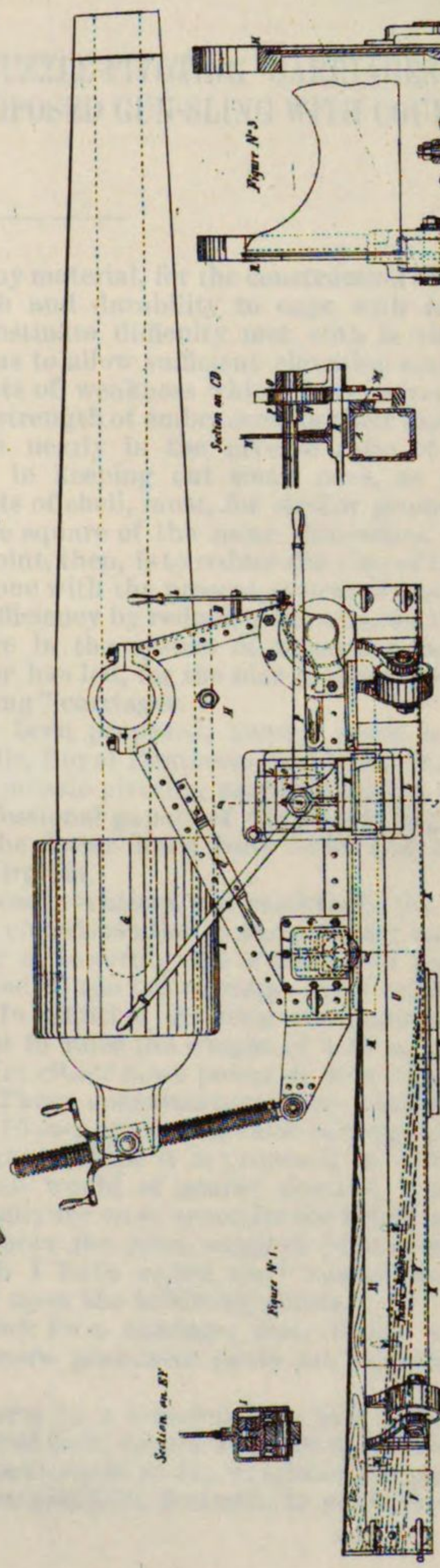
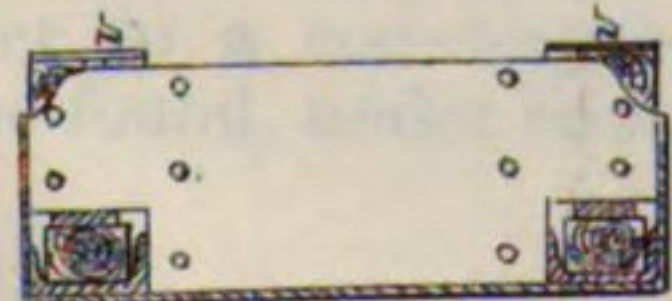
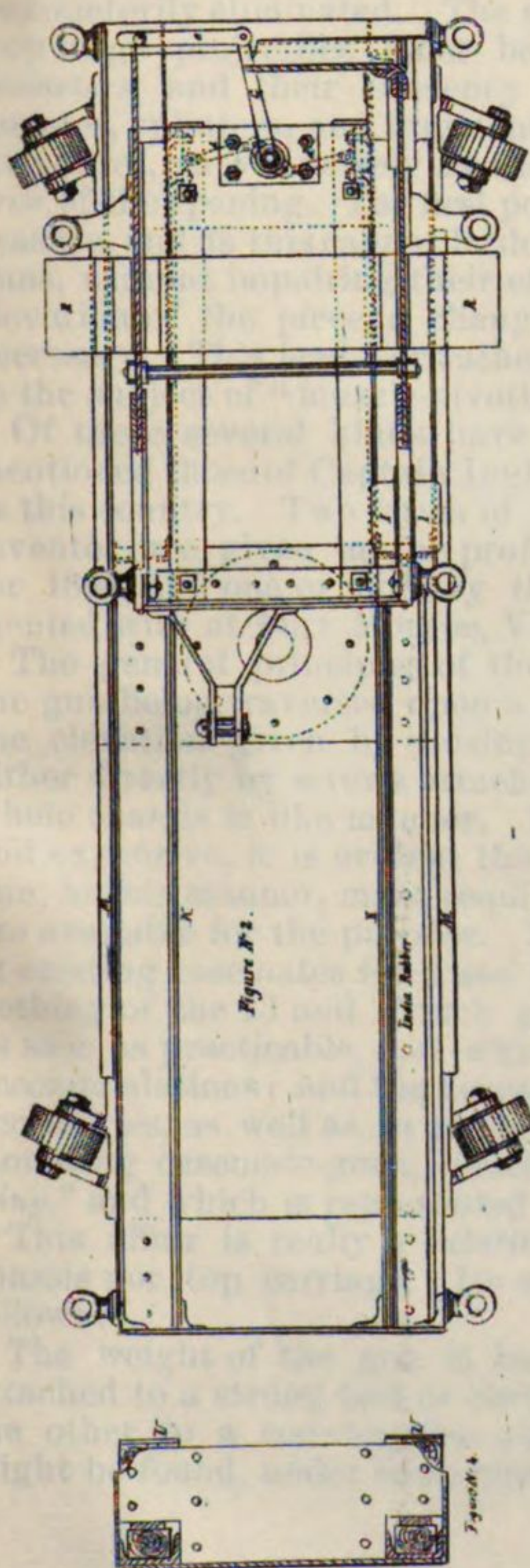


Fig. N° 1 Side view of carriage with gun mounted thereon.
 Fig. N° 2 Upper side of carriage with breech.
 Fig. N° 3 Vertical transverse section of same.
 Fig. N° 4 Rear end of breech.

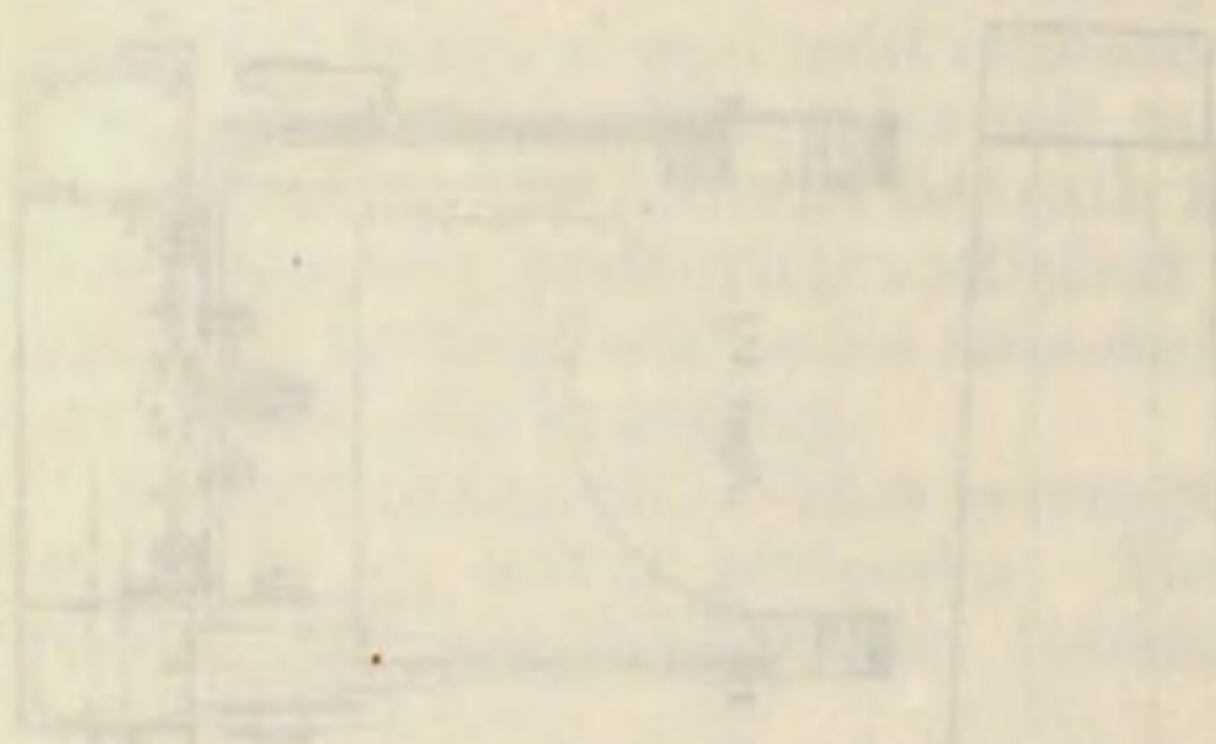
A. Gun
 B. Side of breech of carriage
 C. Breech of carriage
 D. Breech of carriage
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 F. Breech of carriage
 G. Breech of carriage
 H. Breech of carriage
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 T. Breech of carriage
 U. Breech of carriage
 V. Breech of carriage
 W. Breech of carriage
 X. Breech of carriage
 Y. Breech of carriage
 Z. Breech of carriage

Fig. N° 3
 A. Breech of carriage
 B. Breech of carriage
 C. Breech of carriage
 D. Breech of carriage
 E. Breech of carriage
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 V. Breech of carriage
 W. Breech of carriage
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 Z. Breech of carriage

DEVICE FOR CHECKING RECOIL OF HEAVY GUNS

by Capt. J. Wall Wilson, U. S. Rex. Marine.

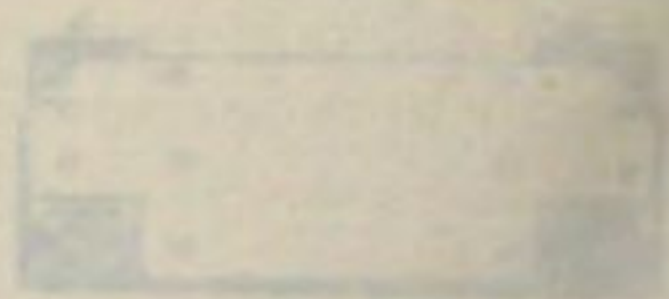
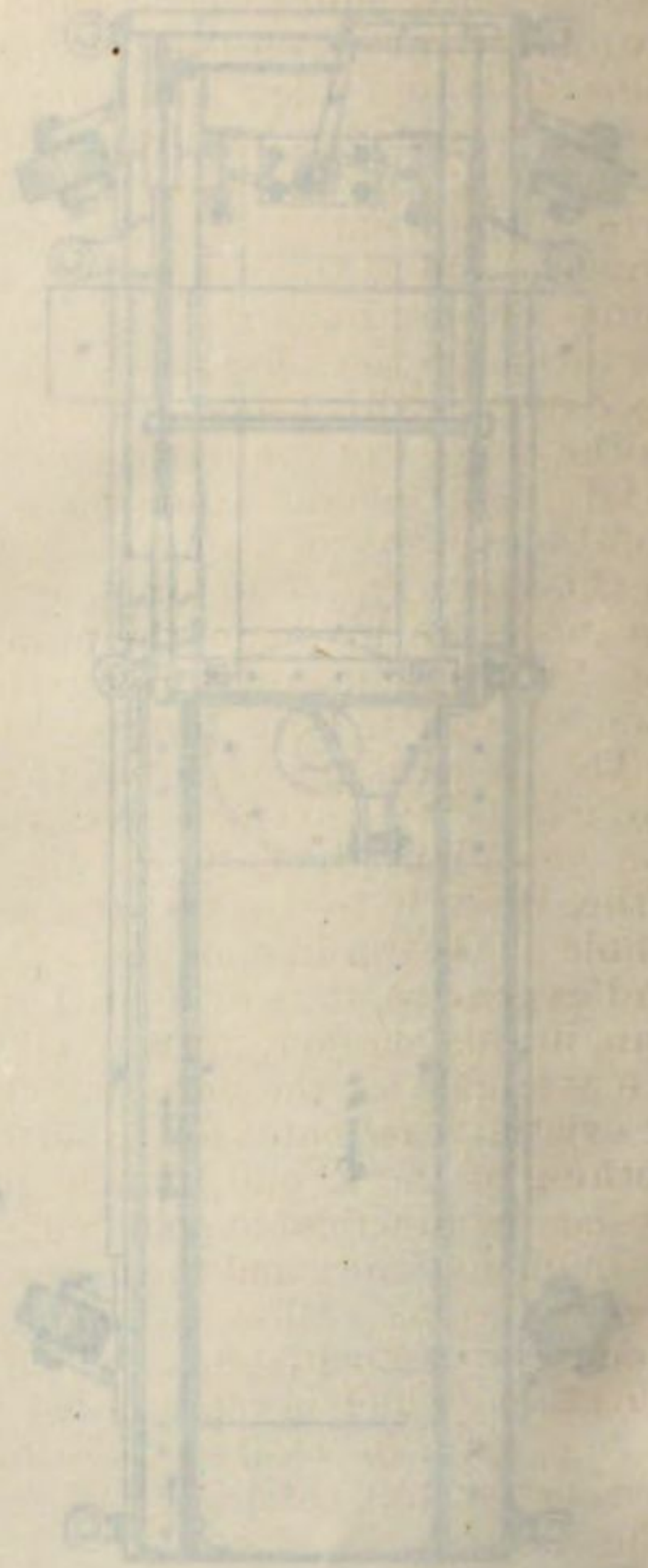
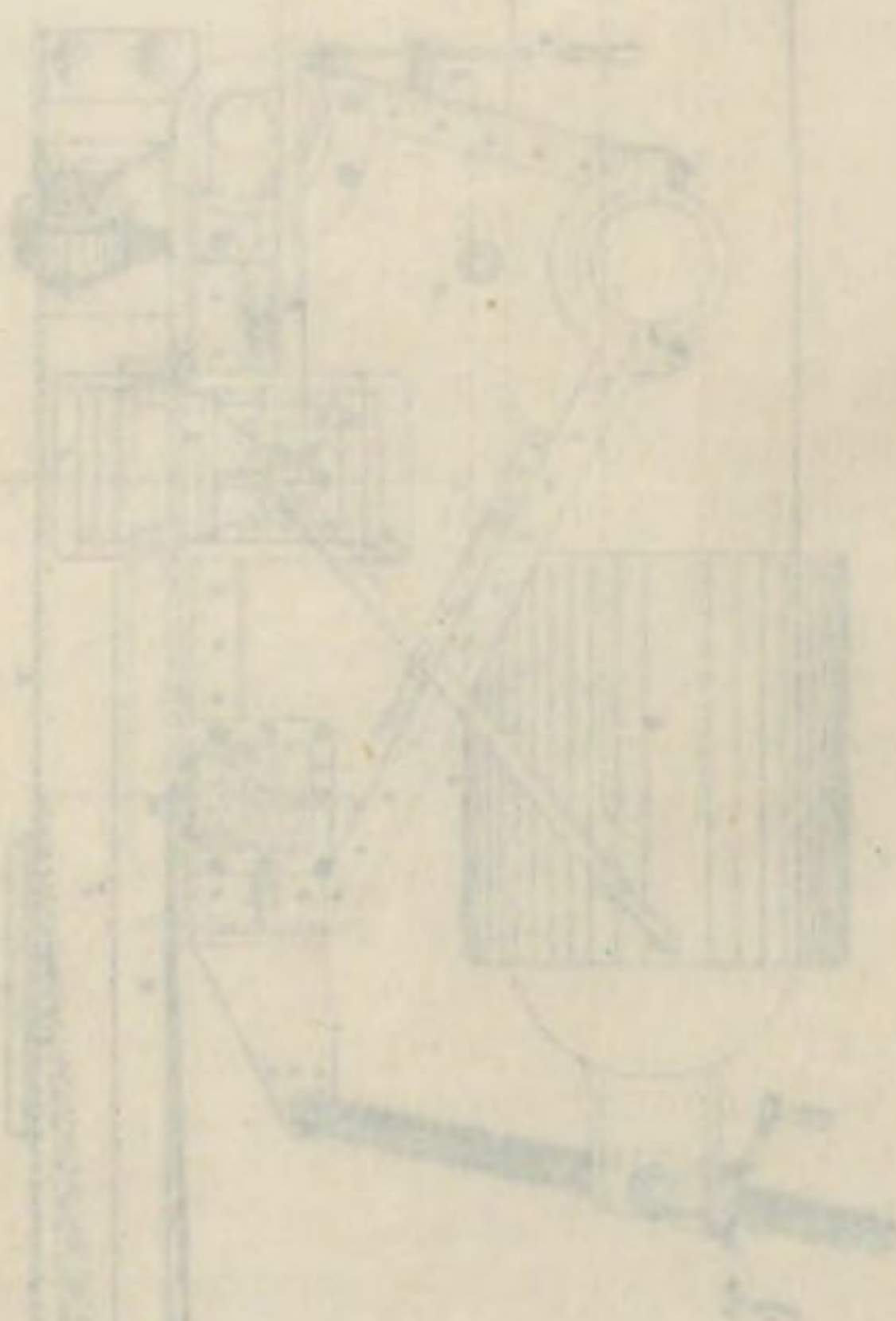
and which was already interested in its use throughout the



The "separator" is a very simple one, the gas being carried off by a series of baffles, the lower part of the gas being carried off and led to a tank, the gas being always at any point on the side exposed

to the gas, is as well adapted for horizontal use as for vertical use, the gas being always at any point on the side exposed

The separator can be built at a much less cost than the separator now in use.



DESIGN FOR CHECKING BECOMING OR HEVLA CRIS

DESIGN FOR CHECKING BECOMING OR HEVLA CRIS

CAPTAIN W. R. KING'S MUZZLE-PIVOTING CARRIAGES FOR CASEMATE-GUNS, AND PROPOSED GUN-SLING WITH COUNTER-POISE.

In the use of iron, or in fact any material, for the construction of scarfs or shields of sufficient strength and durability to cope with modern artillery, the first and most obstinate difficulty met with is the embrasure. To construct this so as to allow sufficient elevation and traverse to the gun involves points of weakness which have never been satisfactorily eliminated. The strength of embrasures or their ability to stop large projectiles must be nearly in the inverse ratio of their *diameters*, and their efficiency in keeping out small ones, as grape, canister, splinters, and fragments of shell, must, for similar geometrical structures, vary inversely as the square of the same dimension, or the *area* of the opening. The first point, then, is to reduce the size of the embrasure, and as this cannot be done with the present system of mounting guns, without impairing their efficiency by reducing the already limited elevation of the piece, a change in the system of mounting becomes necessary. This leads, or rather has led, for the idea is not a new one, to the subject of "muzzle-pivoting" carriages.

Of these several kinds have been proposed, among which may be mentioned those of Captain Inglis, Royal Engineers, and a Mr. Wappich in this country. Two forms of muzzle-pivoting carriages by the former inventor are given in the professional papers of the Royal Engineers for 1864, and one or more by the latter have been built and experimented with at Fort Monroe, Virginia.

The general principles of these inventions are essentially the same, the gun being traversed upon a chassis similar to the ordinary one, and the elevation given by raising or lowering the trunnions of the gun, either directly by screws attached to the top carriage, or by raising the whole chassis in like manner. In addition to being more complicated and expensive, it is evident that to raise the weight of a 10 or 15-inch gun, in this manner, must require either more power or more time than are available for the purpose. These considerations; the want of room in existing casemates for 8 and 10-inch guns with their carriages, to say nothing of the 13 and 15-inch guns, which it is proposed to introduce as soon as practicable, and which would of course demand increased accommodations; and the necessity for more space for the shield and its accessories, as well as to re-enforce the piers, suggested the system of mounting casemate-guns, which I have called the "*counterpoise gun-sling*," and which is represented upon the following sheets.

This affair is really a *substitute* for a carriage, since it has neither chassis nor top carriage. Its more prominent parts are described as follows:

The weight of the gun is borne by a wire-rope, one end of which is attached to a strong bail or curved link, looped over the trunnions, and the other to a counterpoise about equal to the weight of the gun. It might be found, under some circumstances, desirable to work the guns

in pairs, in which case the rope would connect two guns in adjoining casemates, similarly suspended.

The rope passes over a pulley, directly above the trunnions, which has a lateral motion upon rollers, which run upon a horizontal traverse-rail suspended from the intrados of the casemate-arch. (See side and rear elevations.) The rope then leads to a pulley directly over the throat of the embrasure, in order that the rope shall always draw at right angles to the traverse-rail and not interfere with the traversing of the gun. It then runs to the pier between the casemates, where it takes a turn around a windlass, and is then either attached directly to the counterpoise, or connected with a similar system in the adjoining casemate, as before stated.

The windlass (not shown in the drawing) is so arranged that by turning it the gun may be elevated or depressed; but an increase or diminution of the strain upon the rope could not turn the windlass. This is required, since a counterpoise for the gun when it was at rest would not be sufficient when it was swinging as a pendulum.

To guide the muzzle of the piece and check the recoil, as well as to regulate its motion when swinging into battery, two parallel beams of wood or iron are placed over and nearly parallel with the axis of the piece, and attached at the front end to eye-bolts, which serve as a pintle, and, by means of a compressor and guide-pieces, form a sliding connection with the harness or breeching of the piece.

This harness is firmly secured to the trunnions and around the muzzle; and by tightening the nuts of the compressor the recoil may be checked at the proper point for loading. The compressor may be so arranged that it will only be *necessary* to tighten one nut. It will be noticed that the pintle is in a very exposed situation, but if by chance a shot strikes so near the edge of the opening as to hit the pintle, it would probably dismount the gun, whether the pintle was there or in ever so well protected a situation, and it is believed this would occur with any possible form of embrasure or system of mounting guns.

The gun may easily be traversed by train or watch-tackles similar to those used in the Navy for like purposes. These will be attached to the guide-pieces, and left in position when the piece is fired. The elevation of the piece will be adjusted by simply turning the windlass, already referred to, immediately above the counterpoise.

The loading will be effected in the same manner as in case of guns mounted in the ordinary way; the operation being rendered easier, however, by the steps under the muzzle of the gun. These steps answer the double purpose of loading-steps, as just mentioned, and of buttresses to re-enforce the shield or front of the casemate. There will also be room, since there is no chassis to provide for, to re-enforce the piers by a strong concrete backing inclosed in a thin casing of iron, which would prevent any fragments from being detached by the shock transmitted through the masonry from projectiles striking in front.

The dotted line inclosing the piers in the plan, but not shown in elevation, shows the position which these casings might have, though, if necessary, they could occupy still more space in the casemates and communication-arches. The sighting of the piece will be done through openings between the compressor-rails.

When the piece is fired the strain upon the rope will be, at first, diminished, but, as the recoil takes place, it will increase again until it becomes somewhat greater than the weight of the gun. The extent of this variation will not, however, be so great or sudden as to cause any injury to the rope, pulleys, or other parts of the system.

The shield, though not forming an essential part of the system here proposed, that is, any other shield of suitable form may be used instead, is represented as being made of four blocks of Bessemer steel cast in the required form and locked together without planing, fitting up, or bolting in any way, the joints being filled with lead or other soft material. It is thought that by casting these blocks in such a manner that the front or exposed surfaces shall be very *porous*, perhaps with large cavities, and the rear as *solid* as possible, the dangers of both concussion and perforation may be avoided. The cavities alluded to may be formed by a series or groups of cores projecting from the top of the mold; and when the blocks are in position they may be filled with some soft, cheap material, as asphalt, which will give a presentable appearance, and yet allow considerable penetration to the shot which strike it. The use of Bessemer steel in this manner would require some preliminary experiments to get the best mode of casting, so as to avoid unequal strains or cracks from shrinkage in cooling, but the danger to be apprehended from this source can probably be removed by a proper arrangement of the cavities aforesaid, so as to admit a shrinkage in all directions. The *honey-comb* is unquestionably the most advantageous form in which a given weight of metal can be placed in order to resist shot; the only objection to it, in case of wrought iron, being the difficulty of getting the metal into that shape, and as Bessemer steel may be cast into almost any form, if a solid casting is not required, this metal seems especially adapted to the purpose in question.

An account of some experiments with this metal will be found in a report forwarded to the Board of Engineers last fall; and the opinion therein expressed has been confirmed by experiments since made. As before stated, however, this particular form of shield has nothing to do with the merits of the invention herein described.

Although it was not thought advisable to introduce means for absolutely closing the embrasure when the gun is "from battery," such a device could easily be arranged if found desirable.

A recess could be cast in the top or bottom block of the embrasure in which a port-stopper could be inserted and the latter could be so arranged as to be closed either by the recoil of the gun or by a special application of power for the purpose.

Since the muzzle of the gun, when in battery, completely fills the opening, the effect of blast must be greatly reduced from what it is in case of the present embrasure.

Should it be decided that this invention is worthy of further development, detailed drawings and computations can readily be furnished which will supply all the data requisite for testing it experimentally, in any existing work where a suitable casemate and facilities for the construction are available.

The *system of mounting guns* could be tested without altering the casemate or embrasure further than to drill such holes in the masonry as may be necessary to attach the fastenings of the traverse-rail and pulleys.

A trial of the *shield* would require some further knowledge of the circumstances attending the casting of blocks of the shape required, and to this end it might be necessary to make some preliminary experiments at some Bessemer steel establishment.

To *recapitulate*, the advantages sought by this system of mounting casemate-guns, is—

1st. A reduction of the embrasure-opening to an absolute minimum.

2d. As a result of this, and of the additional room gained in the casemate, a stronger shield and stronger fastenings.

3d. An increased elevation of the gun, this arrangement giving 19° elevation and 7° depression.

4th. Thirteen and 15-inch guns may be placed in 10-inch casemates.

5th. Cheapness, since this arrangement would probably cost less than any muzzle-pivoting carriage ever proposed, and even less than the ordinary carriage.

6th. Greater elasticity of the system, and consequently less concussion and less liability to jar and crack the masonry.

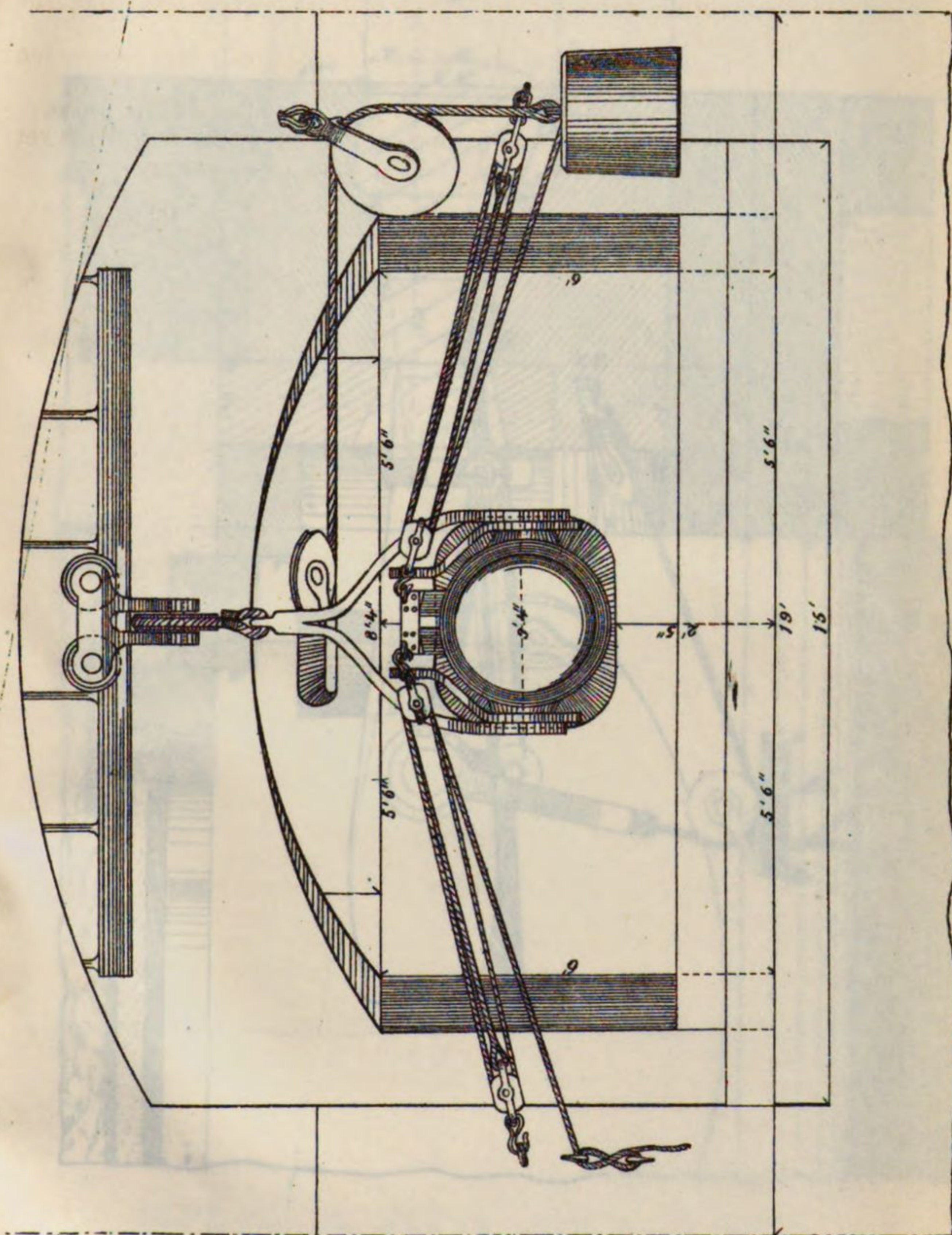
7th. Less annoyance to the cannoneers from the blast of the piece.

8th. As to the *shield*, it is thought that, in general terms, it will answer the requirements of such structures better than anything else.

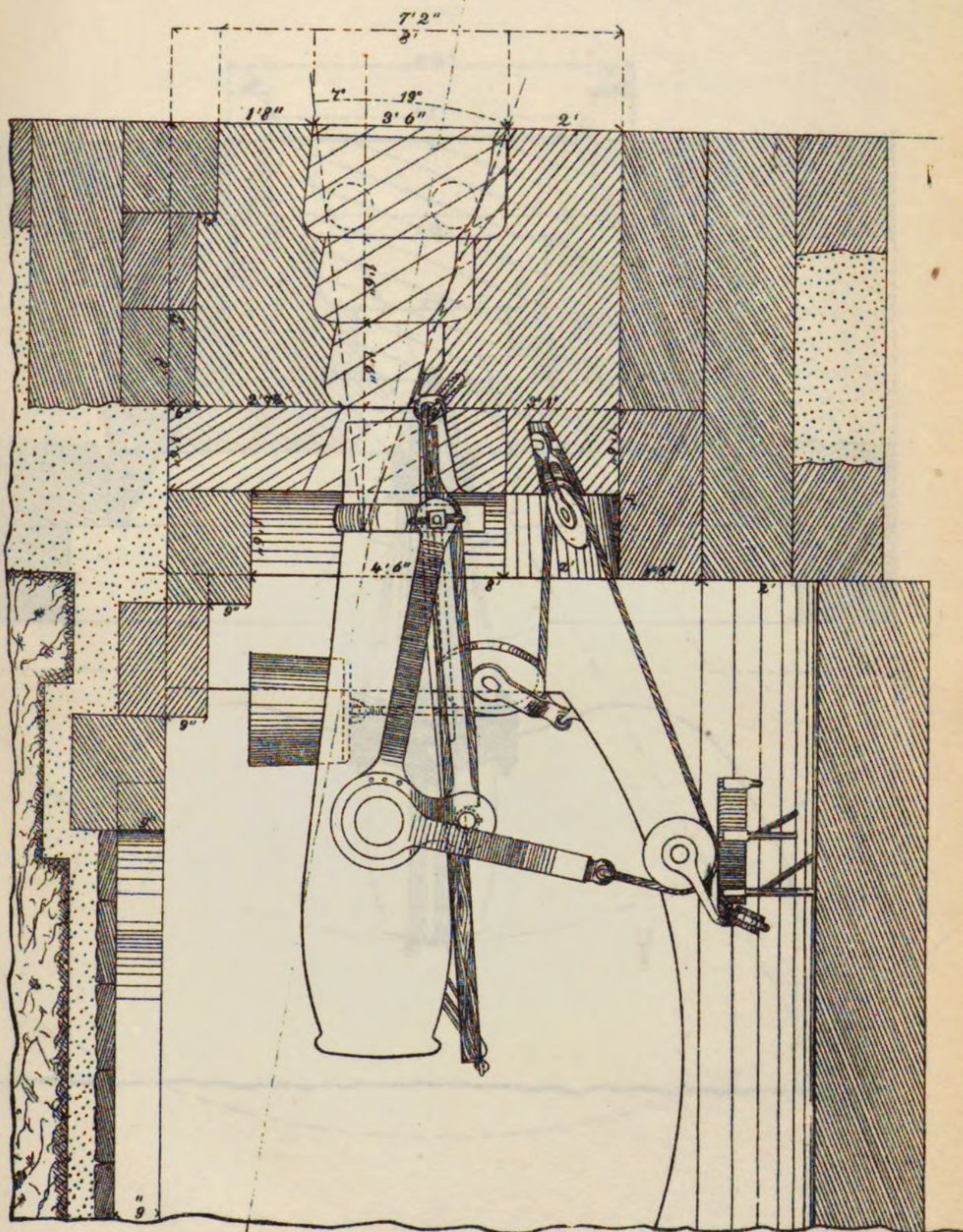
Respectfully submitted.

W. R. KING,

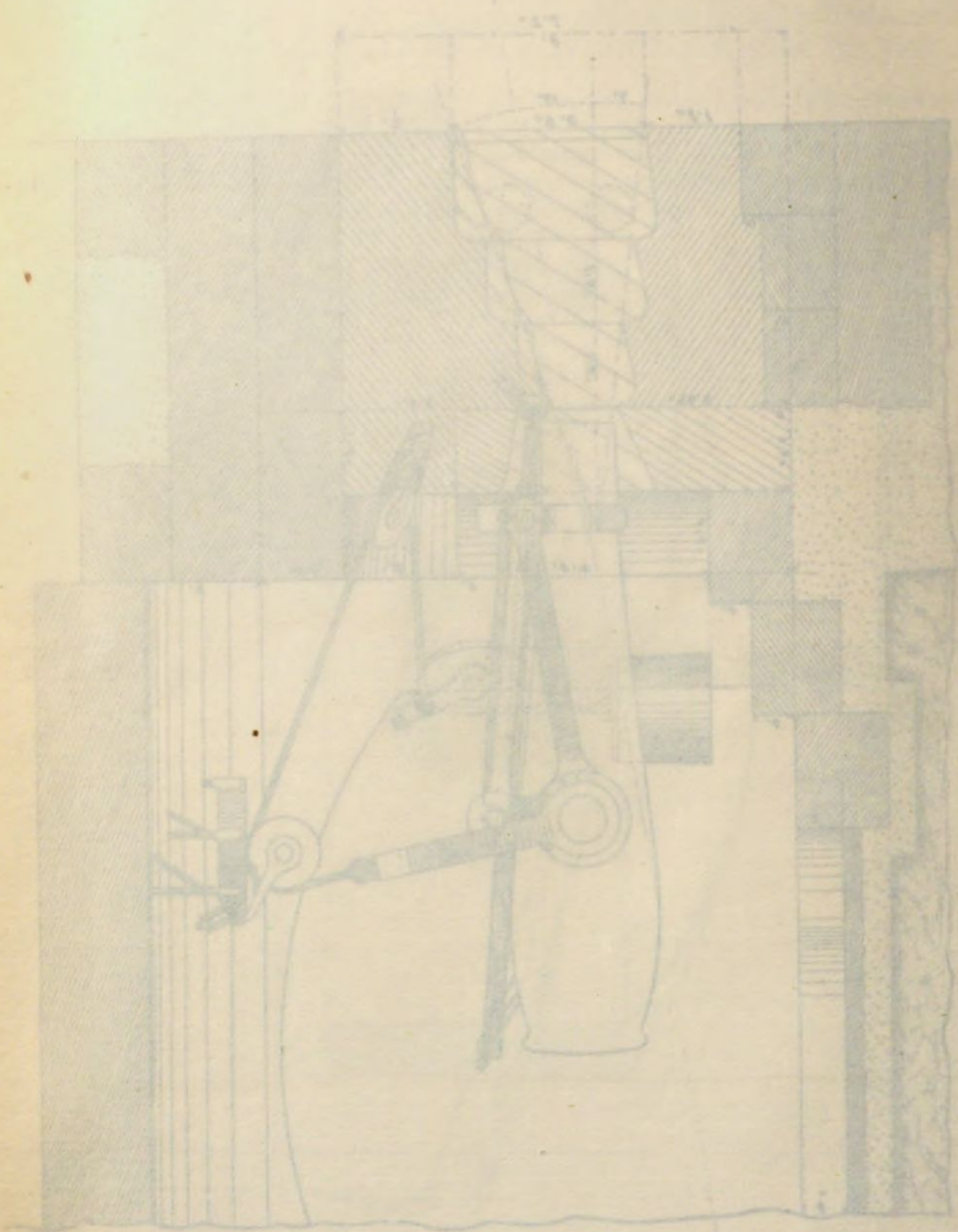
Captain of Engineers, Brevet Major, U. S. A.



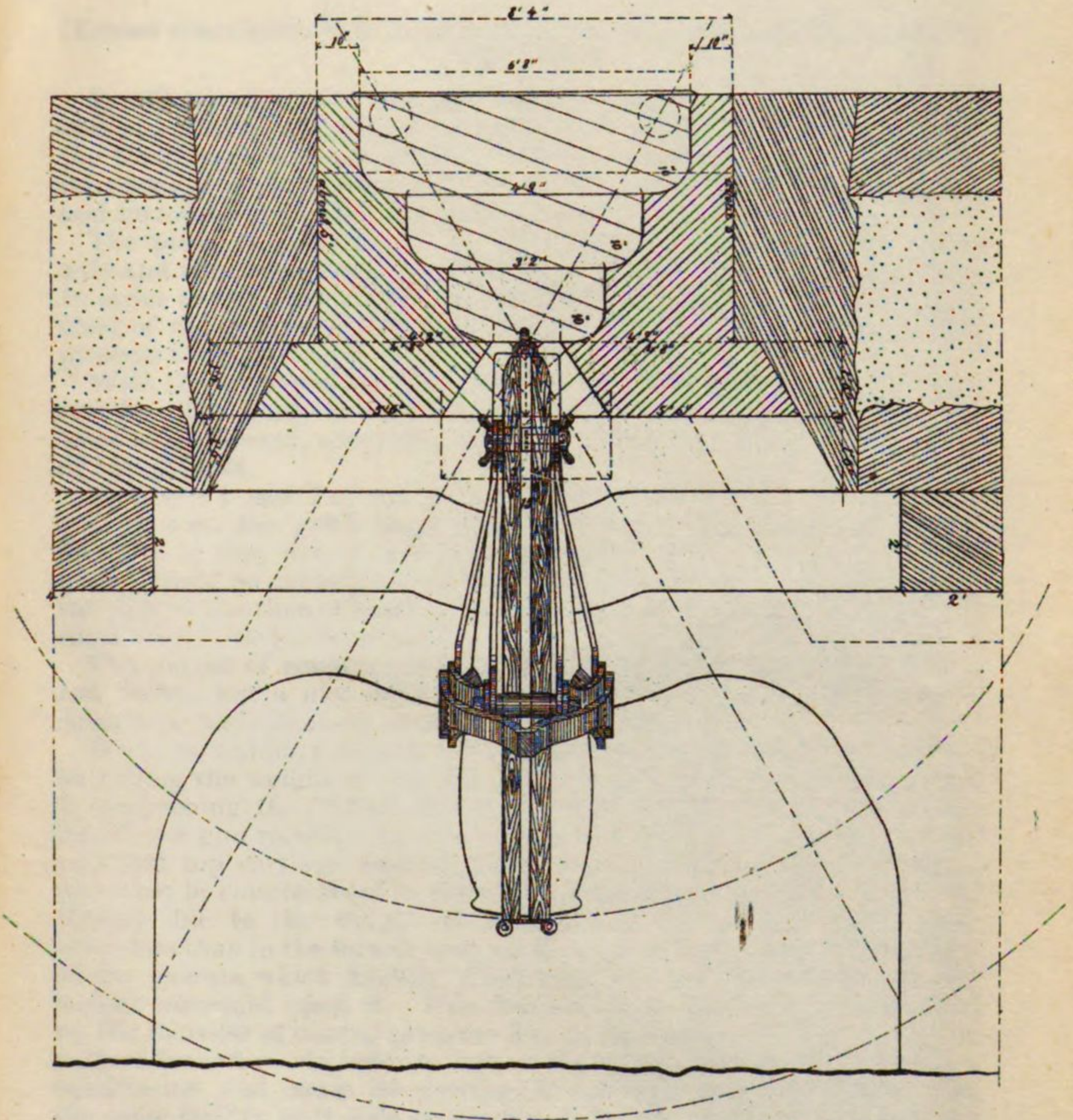
CAPT. W. R. KINGS COUNTERPOISE MUZZLE-PIVOTING GUN SLING.



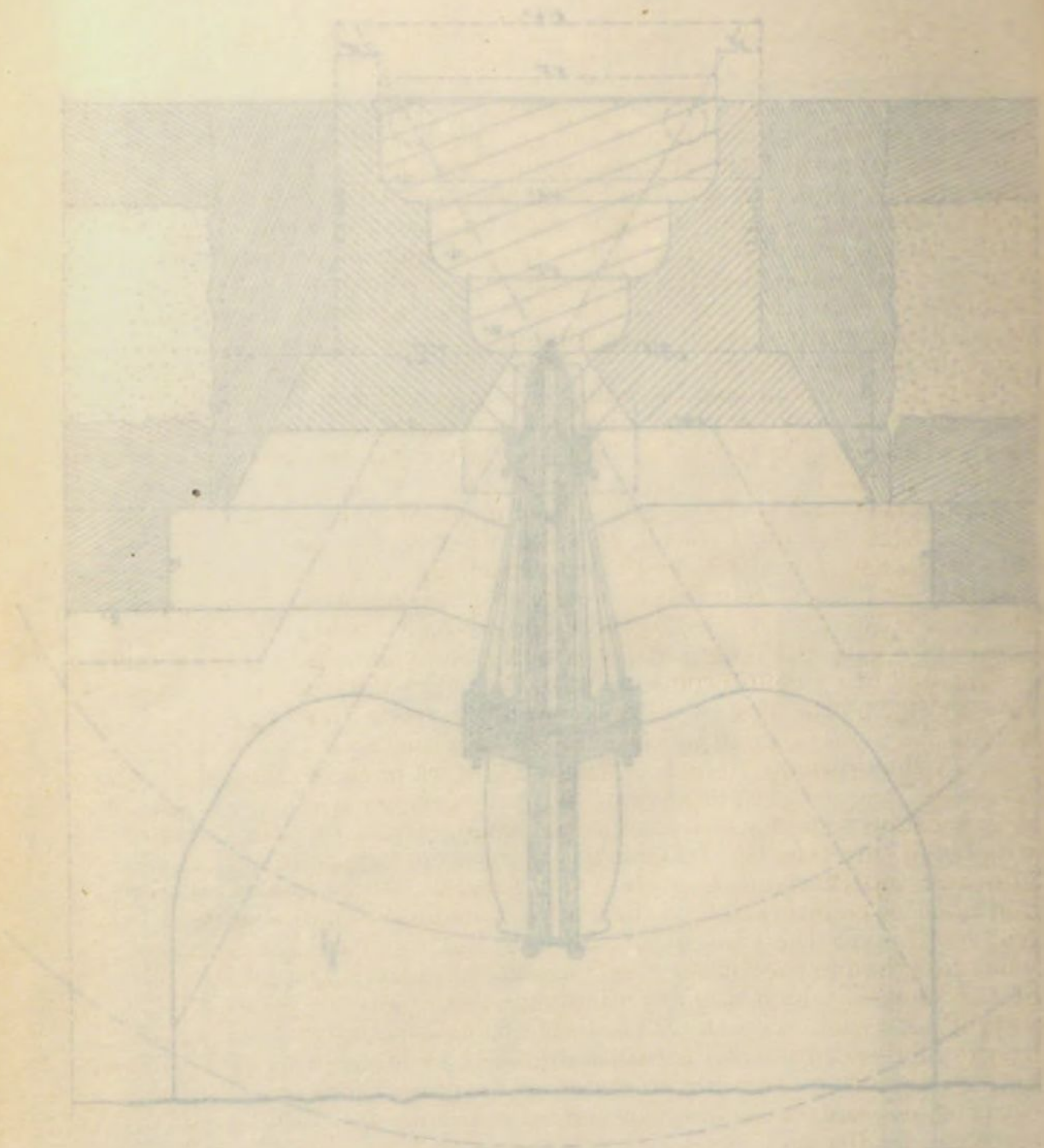
CAPT. W. R. KINGS COUNTERPOISE
MUZZLE PIVOTING GUN SLING.



MUNNIE PIVOTING GUN SLING.
CAPT. W. R. KINGS COUNTERPOISE



CAPT. W. R. KINGS COUNTERPOISE
MUZZLE PIVOTING GUN SLING.



MANUAL PIVOTING GUN SLING.
CAPT. W. R. KINGS, COUNTERPOISE

CAPTAIN W. R. KING'S COUNTERPOISE DEPRESSING GUN-CARRIAGES.

[Extract from Captain W. R. King's work on "Counterpoise Gun-Carriages and Platforms," p. 33.]

It will be seen that the only essential modifications of the present carriage consist in lowering the forks of the rear traverse-wheels, raising the front support of the chassis, cutting a triangular piece off from the top carriage so as to retain the gun at its present level when in battery, and introducing a pulley and wire-rope for a counter-weight.

The pintle is made larger and a vertical hole is drilled through its axis and the pintle-block, to admit the rope leading to the counterpoise. In order to clear the muzzle of the gun when fired at a depression, the crest of the parapet is cut away slightly at those points where the gun projects furthest over it.

With these exceptions, the whole arrangement may remain as it now stands. The work of maneuvering and loading the gun will be the same as at present, excepting that the latter can be done under cover of the parapet.

Numbers 1 and 2 of the gun detachment, standing with one foot on a level with the pintle-block and the other a step lower, and leaning forward, as they would have to do to reach the muzzle of the gun, their heads would be entirely below the crest of the parapet. The muzzle of the gun at the time of loading would of course be brought to nearly the same level with the trunnions, as is now done under like circumstances.

The weight of counterpoise required is easily determined within narrow limits, but a nice adjustment would require that a portion of it should be made in small pieces so as to be adjustable.

With the ordinary 10-inch carriage, the work of the recoil is expended in raising the weight of the gun and top carriage about 7 inches, and in overcoming the friction due to the same weight over the distance to which the gun recoils. In case of the new carriage, the weight of the gun and top carriage *descends* 2 feet 5 inches, which assists the recoil, and must be counteracted by the work of raising the counter-weight; the friction due to the weight of the gun and top carriage being somewhat less than in the former case, on account of the increased inclination of the chassis, which slightly diminishes the normal pressure of the weight aforesaid upon it. This diminution is, however, overbalanced by the increase of normal pressure due to the counter-weight, as will be noticed hereafter. In order to restore the system, therefore, to its proper equilibrium, and cause the carriage to run from and into battery with the same facility as it does at present, it is only necessary to supply by the counter-weight a quantity of work opposed to that of the recoil equal to the weight of the gun and carriage, or 17,000 pounds in round numbers, multiplied by the vertical distance between the center of gravity of the gun and carriage after the gun has recoiled, and the position it would have had if it had recoiled upon the ordinary carriage. This distance, as before stated, is 3 feet, and the work to be supplied by raising the counterpoise is therefore $3 \times 17,000 = 51,000$ foot-pounds.

If the counterpoise is attached directly to the end of the rope, it will have a vertical motion of 7 feet 8 inches, while the gun is running to

and from battery, and, in order to perform the required amount of work, we must have $W \times 7' 8'' = 51,000$, or $W = 6,650$ pounds, nearly. The ultimate strength of a wire-rope, 3.3 inches in circumference, or a little more than 1 inch in diameter, is given by Mr. Roebling at 28,448 pounds, or about $4\frac{1}{3}$ times that required to sustain a counterpoise of the above weight. The rope from the top carriage to the pulley runs nearly at right angles to the direction of motion as the gun starts to run back, so that the shock of the recoil is transmitted gradually to the counterpoise; but as the gun runs farther back, the strain upon the rope becomes more nearly parallel to the chassis, and the component which directly opposes motion increases until the gun is brought to rest, while the normal component, which increases the friction, beginning at nearly the whole weight of the counterpoise, gradually diminishes, and finally becomes very small when the gun has reached its lowest position. The first of these components varies with the cosine and the latter with the sine of the angle which the rope makes with the chassis.

When the eccentric wheels are thrown in gear, the weight of the counterpoise will start the gun into battery, the acceleration gradually diminishing until finally, at some point above the middle of the chassis, the horizontal component of the weight of the gun will become equal to that of the counterpoise, but the momentum acquired by the gun will carry it on, even after the horizontal component of the counterpoise has become less than that of the weight of the gun, and the gun will arrive "in battery" with nearly the same velocity which it has when allowed to descend upon a chassis of the ordinary declivity; the motion being regulated and checked at the proper time, by throwing the eccentric wheels out of gear. The counterpoise is, therefore, started and stopped gradually and without any considerable jerk, both in running into and out of battery. It will also act to prevent the front end of the top carriage from jumping up when the gun is fired, and will give stability to the chassis and diminish the shock upon the pintle.

It is also thought that both hurters and counter-hurters may be advantageously dispensed with, and thus avoid a fruitful source of damage to the carriage. The former will not be required since the gun cannot run off the front end of the chassis, and if, in running back, the top carriage reaches the end of the chassis with a velocity sufficient to require counter-hurters to prevent it from running off, it will be better to let it go and trust to the chance of remounting it, than to attempt to stop it suddenly, and thus dismount the gun and break the chassis or pintle into the bargain. If a breech-rope or some other elastic resistance could be substituted, the case would be different, but to stop a weight of 17,000 to 55,000 pounds instantly, when moving with any considerable velocity, must be, what it has already proved, an impracticable operation. In this arrangement the effect of the counter-weight is such, that even if the carriage ran back so far as to tip down it could not dismount the gun nor upset the chassis, but the rear end of the top carriage would strike the terreplein and the front end would probably remain upon the chassis.

In order to provide against the contingency of the gun being stopped, while running into battery, before it reaches the proper point for firing, a windlass, or some other simple mechanical appliance, should be provided, of such power that two men on each side of the carriage could run the gun up with facility, even without the aid of the counter-weight. This would be required, as it would not do to fire the gun before it was up into its proper position, on account of the sudden strain which would be brought upon the rope.

The use of this description of gun-carriage would require a well or some convenient place in which the counter-weight may have a free vertical motion, without occupying space required for other purposes. In building a new platform, a space may be provided under the pintle-block, as shown in the engraving, unless the battery is over a casemate; in which case, it may be more advantageous to run the vertical hole through the pintle down to the intrados of the arch, and place a strong pulley at that point, under which the rope may be led obliquely, to the rear of the casemate, where the weight may be allowed to rise and fall by the side of a pier. The use of pulleys in this manner would of course increase the friction and loss of power by stiffness of cordage, but the additional length of rope would give greater elasticity to the system, and thus prove an advantage. In the case of a battery already completed, it might be found necessary to remove the pintle-block, though this operation might possibly be avoided by running the rope to a well just under the parapet. This last method would require a little modification of the pulleys at the front end of the chassis to make the rope draw from a point directly over the pintle, so as not to interfere with the traversing of the chassis.

Should it be found, in any case, impracticable to get a vertical height sufficient for the weight, which would be about 10 feet in the clear for the 10-inch carriage, the height required might be reduced nearly one-half by doubling the weight, and using the well-known principle of a movable pulley.

The additional cost of an arrangement of this kind for barbette guns, over the expense of mounting them in the ordinary manner, could not be considerable, since the greater portion of the carriage platform and parapet need to be changed, and the additional parts required cannot, from the nature of the case, be very expensive.

[Extract from Captain W. R. King's work on "Counterpoise Gun-Carriages and Platforms," p. 54.]

15" COUNTERPOISE GUN-CARRIAGE AT FORT FOOTE, MARYLAND.—The slope of the chassis was fixed at $18\frac{1}{2}^{\circ}$, and that appears to be, all things considered, about right. A greater declivity would of course give better cover, but would also require a heavier counterpoise, and the gun would have a greater tendency to jump up, with the top carriage, when fired horizontally or at a depression. The muzzle would also strike the parapet when the recoil took place. On the other hand, a less declivity would not give the necessary cover without increasing the length of the chassis and the depth of the well.

It will be seen that the strain upon the pintle and chassis from great elevations, which produce the most destructive effects upon the ordinary carriage and platform, are very much reduced, the chassis making an angle less by $21\frac{1}{2}^{\circ}$ with the axis of the piece; or 35° elevation upon this carriage would be equivalent to only $13\frac{1}{2}^{\circ}$ on the ordinary carriage, and the strains upon the chassis and pintle increase about with the sine of the angle which the chassis makes with the axis of the piece. The strain upon the top carriage is also, in a measure, diminished, and is *distributed* more than in case of the ordinary carriage.

For the purpose of throwing the top carriage into and out of gear, in order to let it run into or out of battery, the rear wheels only are provided with an eccentric axle.

The front wheels always bear upon the chassis, and the front end of the top carriage is cut away on the bottom as far back as a vertical line through the axis of the trunnions, so that when the rear end of the

carriage is raised by the eccentric, the front end is also clear from the chassis and rests upon the wheels; but when the rear is thrown out of gear, the whole weight of the gun, very nearly, slides upon the chassis. In running the piece up into battery, it is therefore necessary only to raise the rear end of the top carriage, which can be done by two men, since only about one-fifth of the weight of the gun bears upon the rear eccentric, and the counterpoise will start the gun into battery with such a velocity that it will run up to its proper place, where it may be caught by the chocks represented in rear of the forward wheels of the top carriage. These chocks are intended to be left under when the gun is fired, to prevent the wheels from rolling, and thus to increase the friction of the carriage in running back.

To provide against the contingency of the gun being stopped before it reaches its proper position for firing, as well as to run it back for loading the first time, the cranks and chains are attached to the side of the chassis, as shown in the engraving. In ordinary practice it is not supposed that these will be needed, and the pawls which connect the top carriage with the chains are to be habitually detached from them and held up by the spring instead of the position in which the engraving shows them. When wanted for use they are pressed down, and as the cranks are turned, bringing the chain along, they drop into the links and thus attach the top carriage to the chains; but as soon as the chain stops moving, the spring is expected to draw up and detach them at once from the chain and hold them up out of the way, as before mentioned. The cranks and chains are entirely independent of each other, and either can be used alone in case the other becomes unserviceable.

No change has been made in the elevating fulcrum or lever, but a friction-brake has been placed near the fulcrum to prevent the breech of the gun from being thrown down too far when the muzzle draws over the roller at the front of the carriage. This latter takes place only when the gun is fired at a depression or a low elevation.

It will be seen from the engraving that the ends of the ropes are fastened to a hinged socket or swivel, at the middle of the front transom of the top carriage, the ends being bent outward about 90° each, so as to bring the fastenings some distance apart while the ropes draw close together, and in that manner run over the pulley and through the pintle into the well. The ends are made fast in the ordinary way by unlaying the strands and driving conical-iron wedges between them, after which the ends of the wires are bent short down and melted solder poured into the end of the socket to form a solid head. It should be stated that there are not in reality *two* ropes, but a single rope is doubled, the loop being at the pulleys immediately under the pintle-block. The rope is lashed to the horizontal pulley, which has a slight angular motion, sufficient to equalize the strain upon the two parts of the rope; but in case one part is broken, this pulley strikes against a shoulder in such a manner as to prevent the unbroken branch of the rope from pulling out. It is thought that the carriage could thus be worked perfectly well with a single branch of the rope. In case both branches become disabled the gun would run back until the top carriage struck the terreplein, in which position it could be used as a mortar.

The main pulleys are two feet in diameter, and contain a double groove for the parallel ropes. It would have been better to have made these pulleys three feet in diameter, or perhaps larger, but they were cast before all the details of the carriage were worked out, and it has not been thought advisable to replace them at present.

The weight of the counterpoise is, in round numbers, 42,000 pounds,

one-half of which comes upon the carriage and the other upon the fastening at the pintle-block. The strain upon the rope when the gun is fired is made up of two parts, one due to the *weight* and the other to the *inertia* of the counterpoise. The former is 10,500 pounds, or one-fourth of the whole weight of the counterpoise upon each section of the rope. The latter depends upon the rate at which the gun acquires its velocity, and upon the elasticity of the system. Since the gun acquires its velocity very suddenly—with a charge of 50 pounds for example, it attains its maximum velocity in less than one inch of the starting point, and its connection with the weight is such that, leaving elasticity out of the account, the latter must acquire about one-half of its velocity in one-fourth of this space—it is evident that some elasticity must be provided for, in order to secure additional time for the weight to move and thus diminish the strain upon the rope. This was sought to be accomplished by the use of a steel-wire rope, and by placing rubber springs below and between the sections of which the counterpoise is composed. In order to test the efficiency of this arrangement, the revolving cylinder, already mentioned, was placed in a vertical position near the counterpoise and the pencil attached to the latter. The cylinder being set in motion at a nearly uniform velocity and the gun fired, the pencil described a helix, which being developed was found to coincide almost exactly with a parabola for some distance from the initial point; and it was also found that the weight had raised about two inches, for the 50-pound charge, before it attained its maximum velocity. The parabolic form of the curve showed that the force producing the velocity, the strain upon the rope, was sensibly constant, and the distance passed over in acquiring the velocity was as great as the force of gravity would require to generate the same velocity, which amounts to saying that an additional strain upon the rope equal to the weight of the counterpoise would have produced this motion. We have therefore a total strain upon the rope, for a 50-pound charge, of $10,500 \times 2$, or 21,000 pounds. The work of inertia developed in the gun and counterpoise should increase a little faster than the weight of the charge, other circumstances being equal, and we would therefore have the additional strain due to a charge of 100 pounds—say 25,000 pounds, making the total strain upon each rope for this charge 35,500 pounds. These are not presumed to be exact figures, as further experiment is necessary to verify the data upon which they are based before accurate computations are attempted. The foregoing is, however, in all probability, a very fair approximation to the true result, and it coincides very nearly with former calculations.

It should be stated that one object of the movable pulley attached to the counterpoise is to diminish the velocity of the counterpoise, and thereby reduce the work of its inertia. The velocity is divided by 2 and the weight multiplied by 2, but since the square of the velocity enters the expression for the work of inertia, with the first power of the weight, it is clear that the effect of this arrangement is to divide the whole work of inertia, and hence the strain upon the rope by 2, or,

$$2W \left(\frac{V}{2} \right)^2 = \frac{WV^2}{2}$$

In regard to the probable durability of the rope, it may be remarked that under favorable circumstances similar ropes have been in almost constant use for many years for hoisting-gear and other purposes, and as this rope will have to run back and forth only about one thousand times, in order to outwear an ordinary service-cannon, it is evident that with proper attention to its preservation no doubt need be entertained in regard

to its durability. The enlargement of the pulleys, already suggested, would add to the durability of the rope, and it may be found that a larger co-efficient of safety is desirable for the same purpose.

A chain with flat links, held together by pins or rivets, similar to those in common use, upon planing-machines and other machinery, has been suggested as a substitute for the rope, on account of its greater durability, and it would undoubtedly possess this advantage. It would, however, be much less elastic, and would be liable to injury from the torsional strain produced by traversing the carriage. In case a chain is found desirable, the most advantageous form of links will doubtless be that of a new kind of weldless chain, the links being formed by cutting them from solid plates of steel or iron. After hammering them to the proper size, they are connected by bending and looping them together. A chain of this kind is more reliable, since it is free from welds, and may be bent or twisted as readily as an ordinary cable-chain.

In traversing this carriage, the weight to be lifted by the eccentrics of the chassis is about one-third greater than in the ordinary carriage. An easy remedy for this inconvenience may be had by allowing the front end of the chassis to rest upon the wheels all the time, as before suggested.

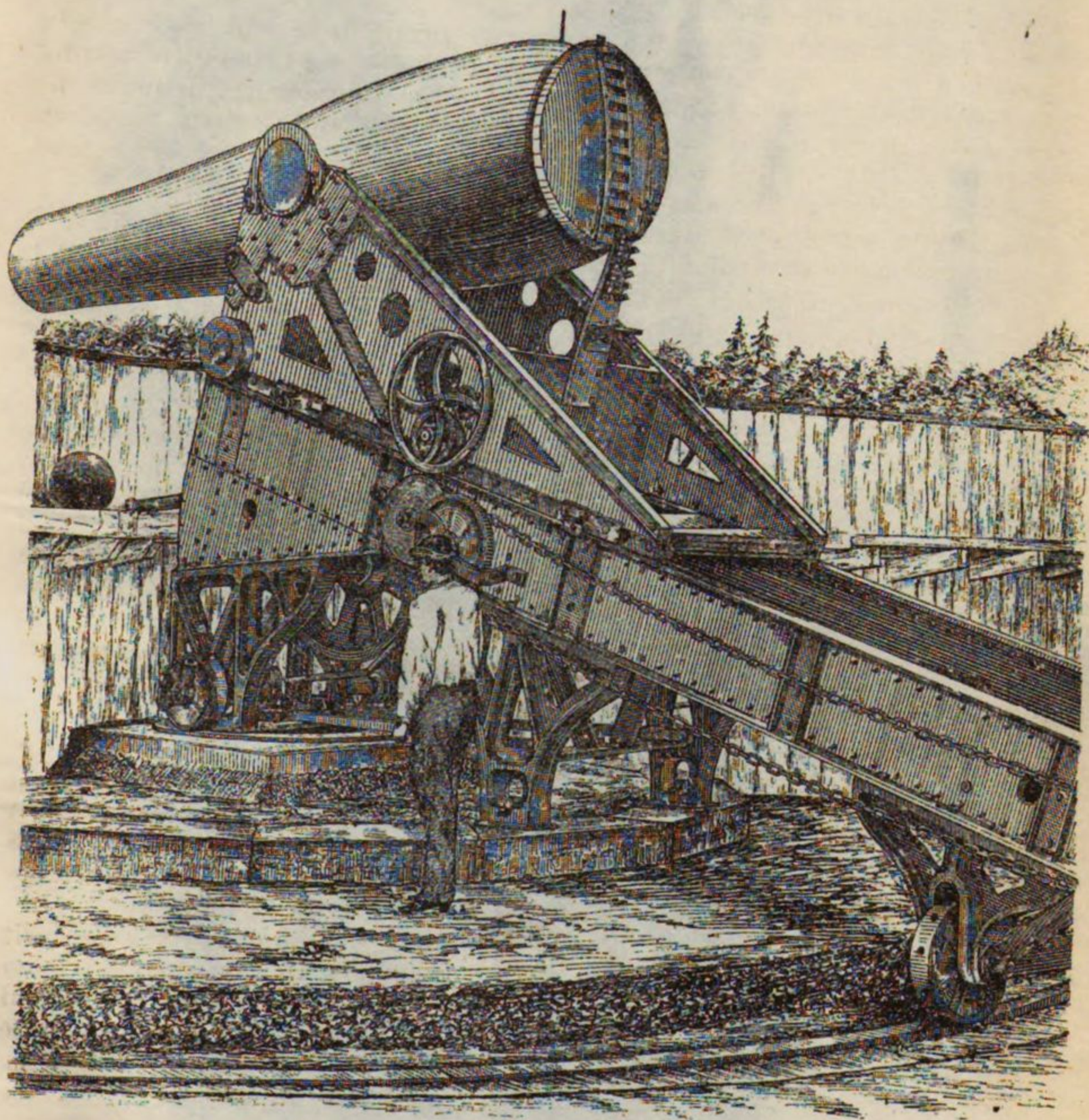
With the foregoing exception, the chassis may be traversed in precisely the same manner as that of the ordinary carriages.

One of the most difficult questions in this, or in fact in any carriage for 15-inch guns, is to provide an easy method for raising the shot to the muzzle of the gun, the weight of the solid shot, from 430 to 450 pounds, being about as much as six men can easily handle on level ground under the most favorable circumstances. To raise this shot even breast-high by main strength requires too great an effort, and to raise it by pulleys or other tackle and enter it into the muzzle requires too much time and skill on the part of cannoneers. In case of the 10-inch carriage before described the shot could easily be raised over the front transom of the chassis, since this transom is much lower and the shot much lighter than in the case under consideration. Between the first and second transoms of the chassis of this carriage there are two parallel bars which serve the double purpose of protecting the rope and of a tram-way upon which to roll the shot into the gun. The question resolves itself into finding the easiest way to get the shot upon this tram-way. Three plans for loading have been suggested:

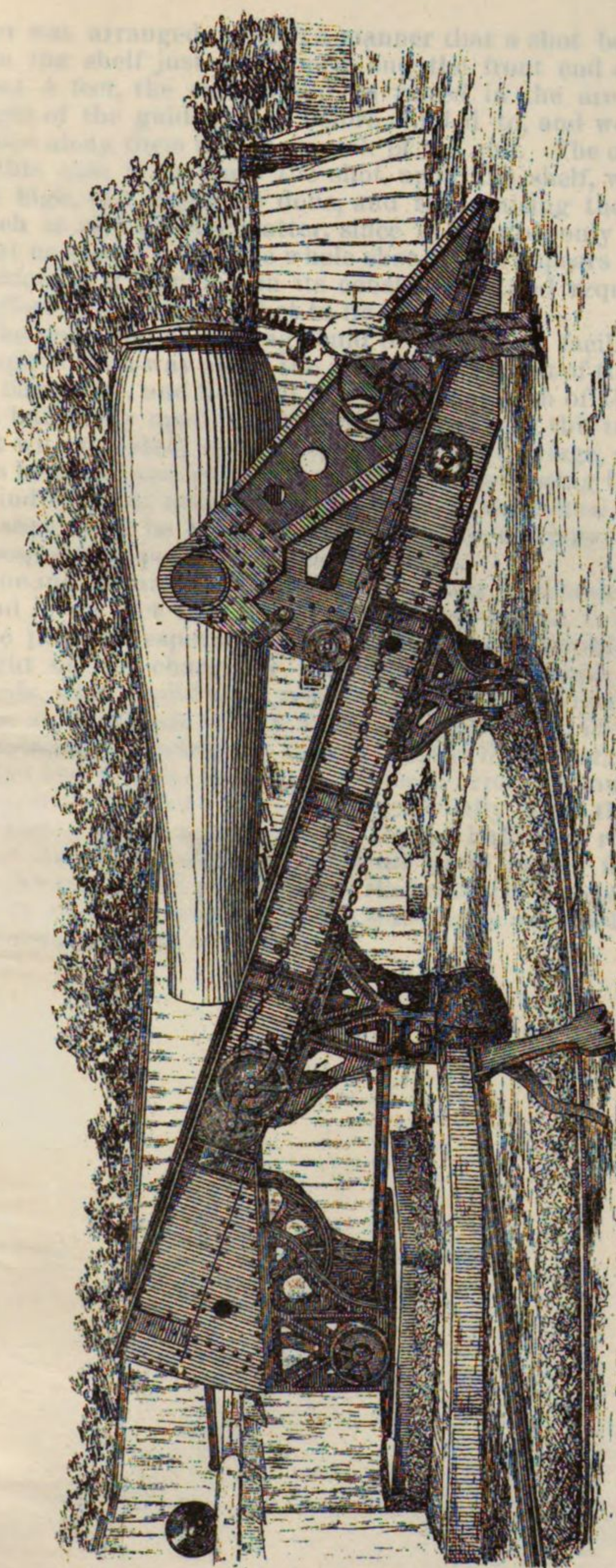
1st. A kind of ladle with two long handles, forming nearly a straight bar, with a place for the shot in the middle. The shot was rolled from the pile into this ladle and carried up to the side of the carriage, and the ladle lifted over and across the chassis, bringing the shot opposite the muzzle of the gun, into which it was rolled by tilting the ladle sideways. The only difficulty was to raise the ladle high enough for the shot to clear the chassis-rail.

2d. A kind of crooked ladder was made, which was hooked over the side of the chassis, the outer end sloping down to within about 4 feet of the platform. The shot was lifted to the end of this ladder and rolled upon it over the chassis-rail to a point opposite the muzzle of the gun, where the ladder turned at right angles and guided the shot into the muzzle. The objections to this plan were the difficulty of placing the ladder in position and of raising the shot as high as its lower end. On the whole it gave a tolerably satisfactory result, and might have been improved had not a better plan suggested itself.

3d. A small shelf was placed upon the front end of the chassis and about 2 feet above the pintle-block, and just in rear of this a kind of



CAPT. W. R. KINGS DEPRESSING CARRIAGE.



CAPT. W. R. KINGS DEPRESSING CARRIAGE.

CYCLE H. H. KINGS DEPRESSING CYBERNET



lever was arranged in such a manner that a shot being rolled upon it from the shelf just mentioned, and the front end of this lever lifted about 4 feet, the shot would be raised in the arc of a circle to the height of the guide-pieces before alluded to, and would roll on to and thence along them into the muzzle of the gun. The only lifting required in this case is to place the shot upon the shelf, which, being only 2 feet high, can easily be done, and then raising the end of the lever, which is also an easy matter, since it requires only about one-half the effort necessary to lift the whole shot. This appears to be a satisfactory solution, as it is simple in its construction and requires no great skill or effort in getting the shot to its place.

The operation of loading could be very much facilitated by placing a trough or tram-way along the interior revetment of the work, just above the banquette, and keeping the shot, or enough of them for immediate use, habitually upon it. A movable portion of this tram-way could connect with the shelf at the front end of the carriage, and the shot could thus be rolled and placed in the gun without being lifted at all, excepting indirectly by means of the lever before mentioned. For convenience, the shot could be kept on one side of the carriage, and the shell in a corresponding position on the other side,

One inconvenience in working a carriage of this description might be found in the fact that the gun rarely ever recoils twice to precisely the same position, especially when there is considerable variation in the weight of the charge or projectile. For example, a charge of 100 pounds, with a solid shot, would cause the gun to recoil more than twice as far as 50 pounds with a shell. This difficulty, it is thought, can be overcome by greasing the chassis for the light charges, and sanding it for the heavy ones; at least so far as to bring the muzzle to rest within the space convenient for loading, especially since this space is some 5 or 6 feet. To aid in this matter strong buffers of rubber are attached to the rear of the chassis; but if all these means fail, in any case, to stop the gun at the proper place, the eccentric-wheels may be thrown in gear to allow it to run up, or the side-chains attached to run it back, as circumstances may require.

CENTER-PINTLE CHASSIS FOR MORTAR-CARRIAGES.

[Extract from report of Board of Officers convened under Special Order No. 61, dated Adjutant General's Office, March 16, 1870. (See Ord. Mem. No. 10.)]

"22. ALTERATIONS SUGGESTED BY THE ARTILLERY BOARD.—The Board having considered the various recommendations and suggestions made by the Artillery Tactical Board, as contained in the letter of the President of the Board, Brevet Major General W. F. Barry, presents the following as their action in the matter. The figures in brackets are references to the recommendations as they are numbered in the letter of the Tactical Board.

"* * (c.) [5. Recommending a center-pintle chassis or turn-table for sea-coast mortars.] The Board recommends the construction and trial of a chassis for the 13-inch mortar, to be so made that when the mortar is fired the chassis shall rest on its platform through its entire length."

This recommendation was approved by the Chief of Ordnance, and was concurred in by the Secretary of War April 29, 1870.

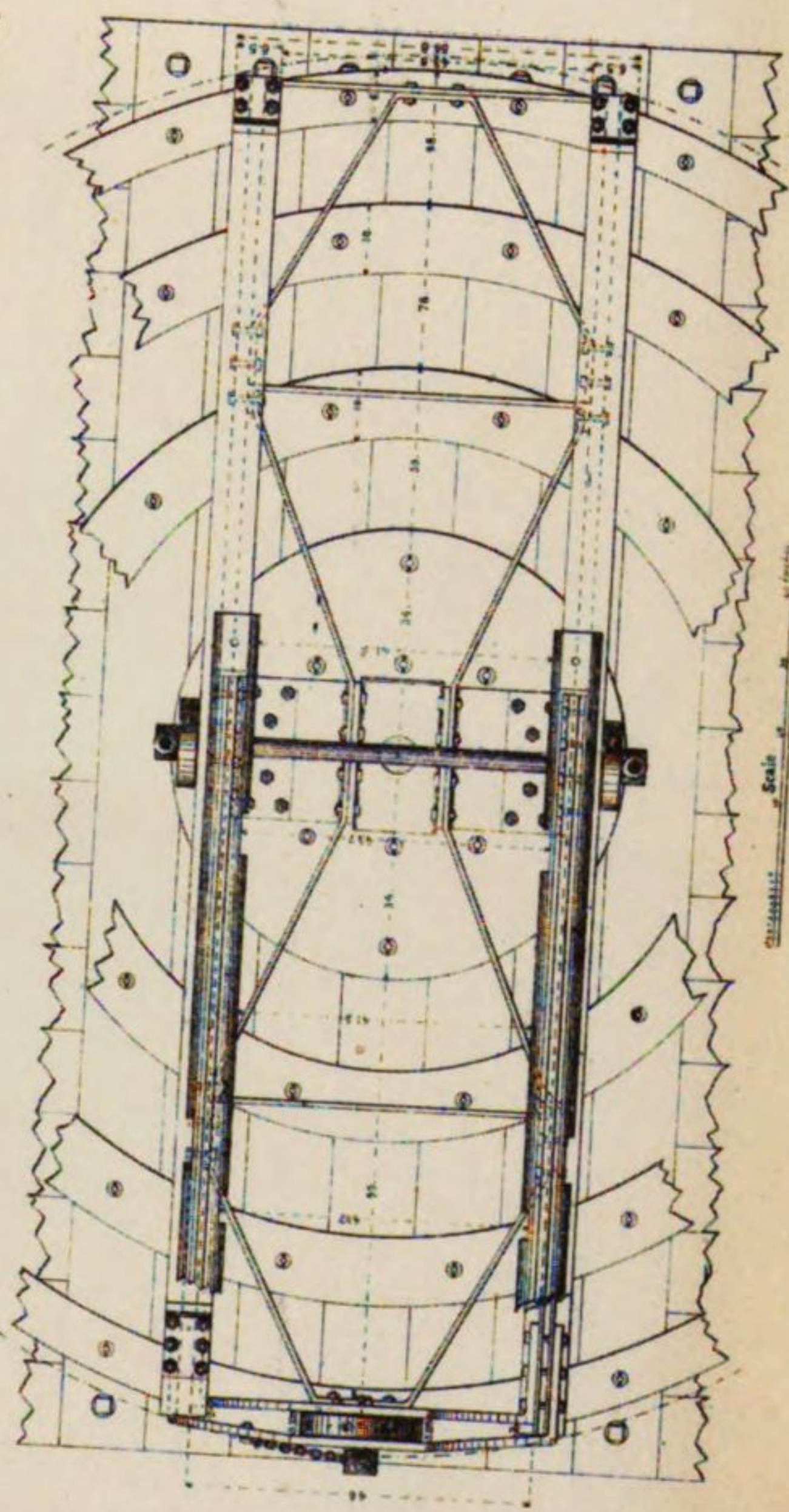
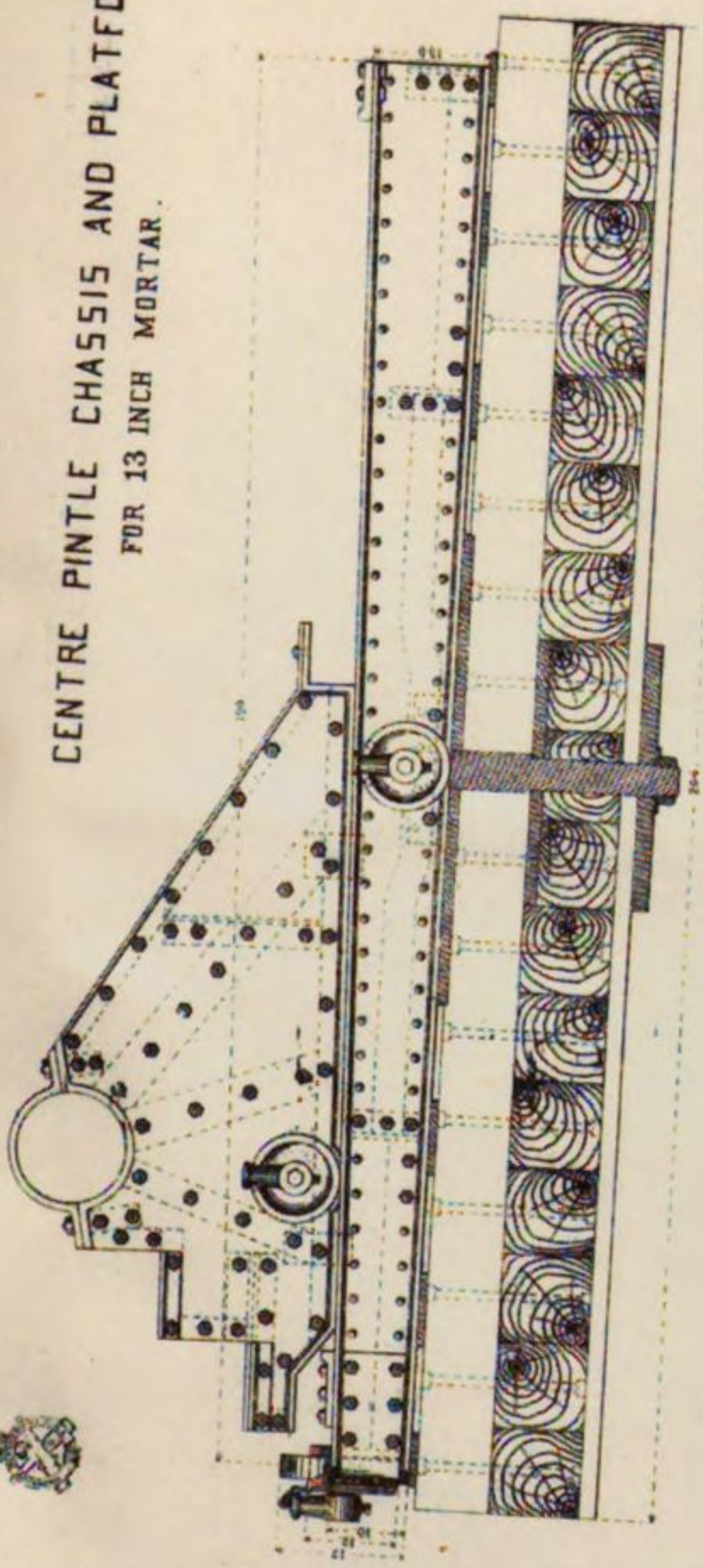
The centre-pintle chassis for mortar-carriages, referred to in the resolution of the Board on Depressing and other Carriages, on p. 18, was made at Fort Monroe Arsenal, in pursuance of the above recommendations. See drawing, herewith.

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THE HISTORY OF THE UNITED STATES

The history of the United States is a story of growth and change. It begins with the first settlers who came to the shores of North America. These early pioneers faced many hardships, but they persevered and built a new life for themselves. Over time, the colonies grew in number and in size. They developed their own laws and customs, and they began to assert their independence from England. The American Revolution was a turning point in the nation's history. It was a struggle for freedom and self-government. The colonists fought bravely against the British, and they won their independence. The new nation was born, and it began its journey as a free and sovereign state. The history of the United States is a story of progress and achievement. It is a story of the people who have shaped the nation, and of the values that have guided them. From the first settlers to the present day, the United States has grown from a small colony to a great nation. It has made many contributions to the world, and it continues to do so today. The history of the United States is a story of hope and possibility. It is a story of the American dream, and of the belief that a better life is possible for everyone.

CENTRE PINTLE CHASSIS AND PLATFORM FOR 13 INCH MORTAR.

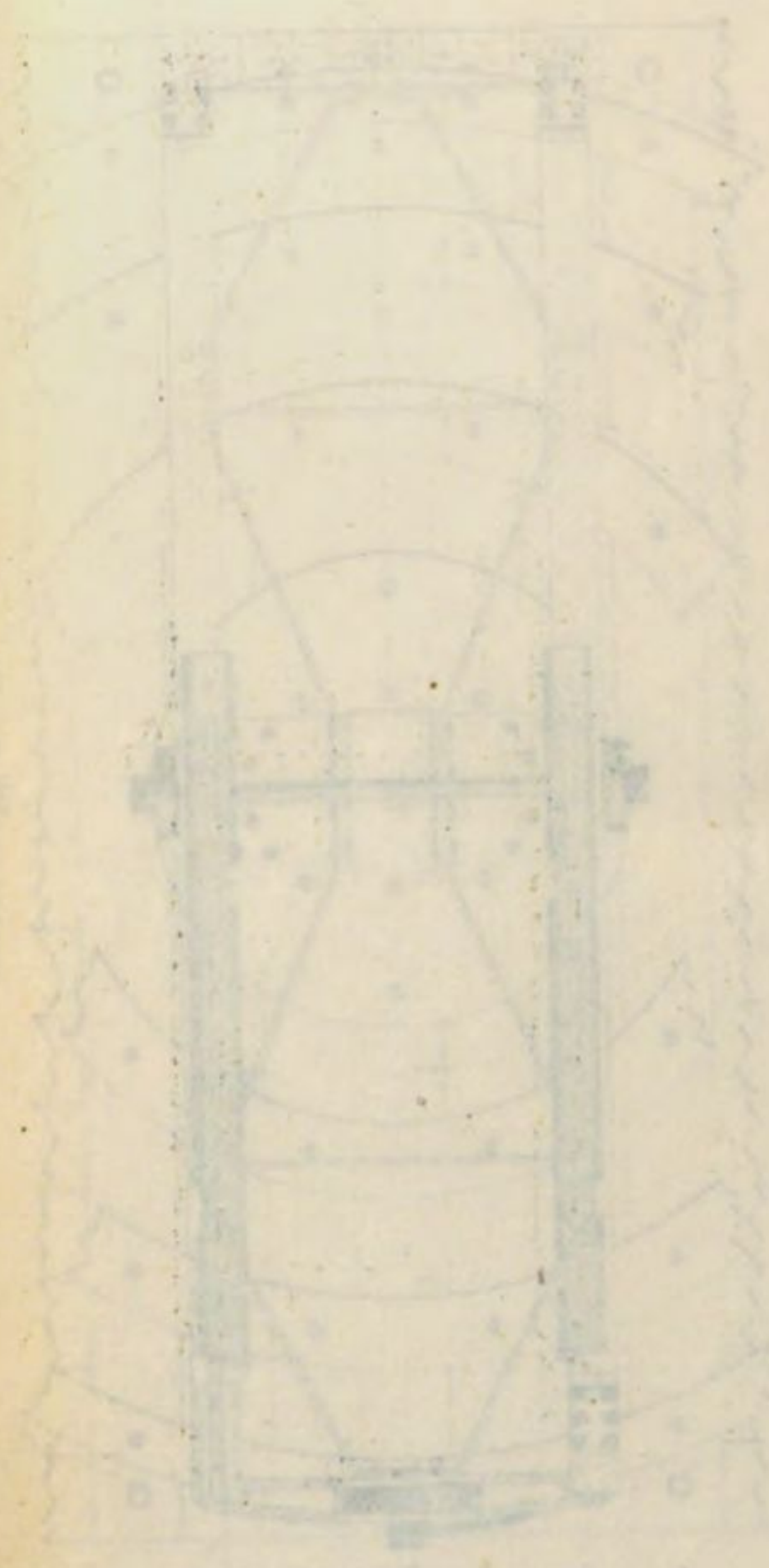
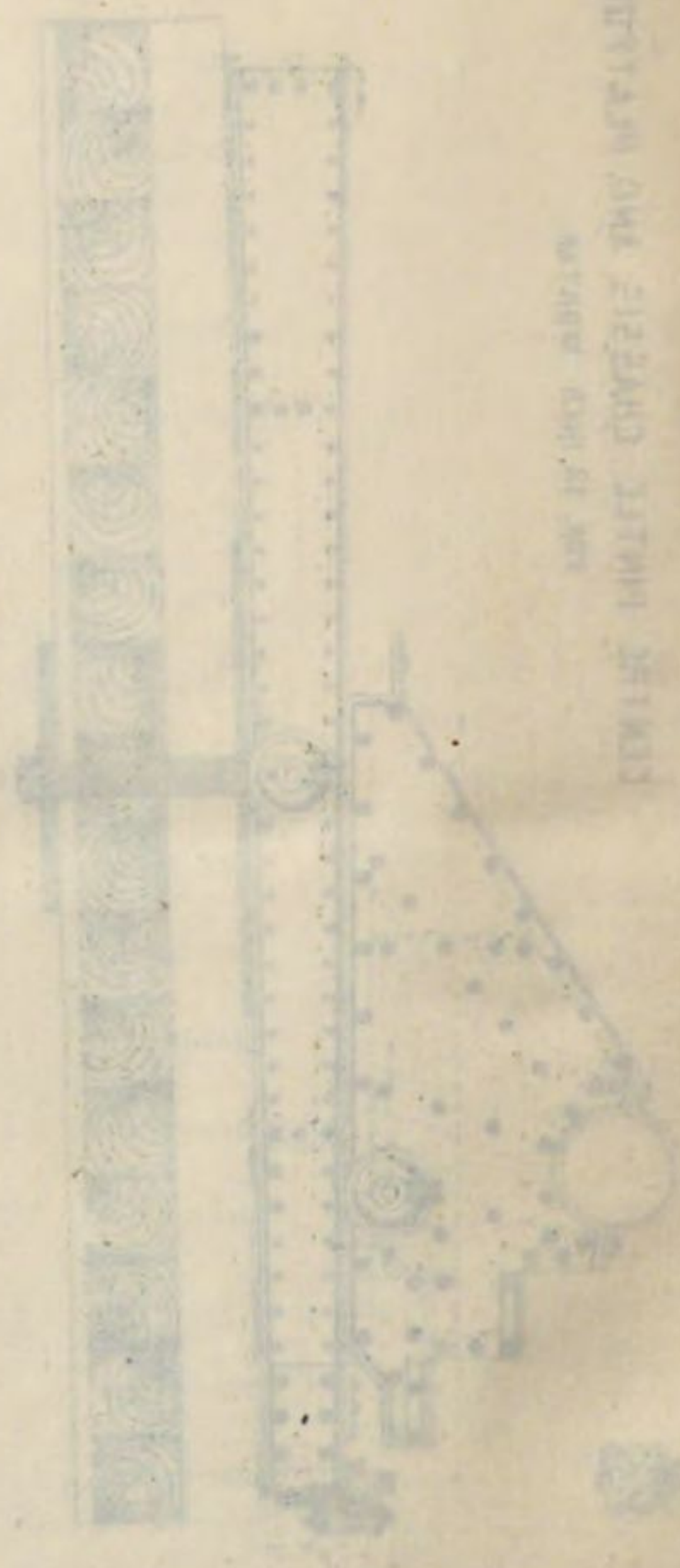


Scale 1" = 10'

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

FORT MONROE ARSENAL 1873.

ARTIST'S COPY OF THE
ORIGINAL DRAWING



House documents

Bd.: [270,d.] 1873/74, Vol. 2,3 = Congress 43, Sess. 1

Washington, DC 1874

Am.b. 3040-270,d,2,3

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